DIRECTOR: CATHY BAILEY

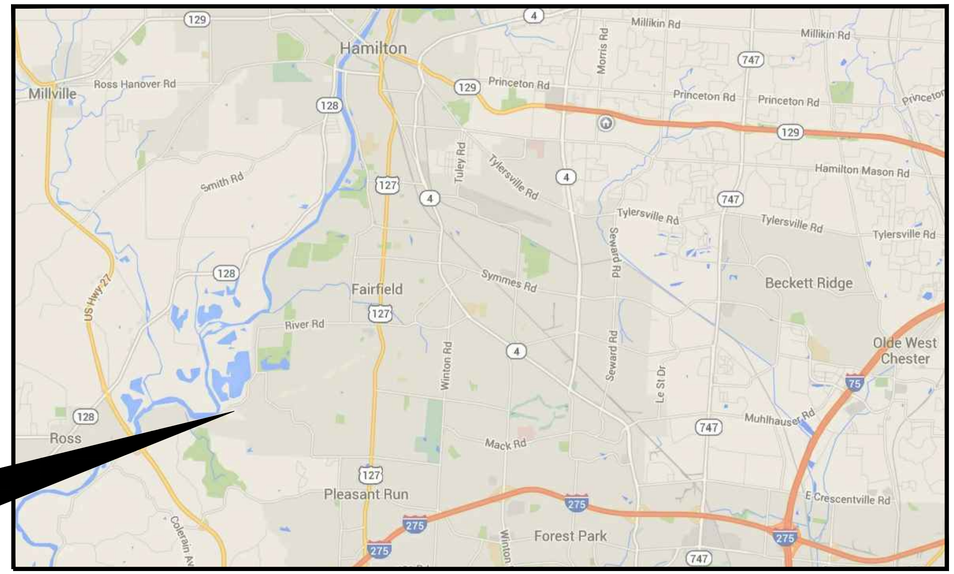
SUPERINTENDENT OF WATER SUPPLY:
JEFFREY PIEPER, P.E.

NOTICE OF CONFIDENTIALITY – PUBLIC INFRASTRUCTURE RECORD

THIS DOCUMENT IS A PUBLIC INFRASTRUCTURE RECORD OF THE CITY OF CINCINNATI AND ITS GREATER CINCINNATI WATER WORKS, AND IS NOT SUBJECT TO THE PUBLIC DISCLOSURE REQUIREMENTS OF THE PUBLIC RECORDS LAWS OF THE STATE OF OHIO AND FEDERAL GOVERNMENT. THIS DOCUMENT IS BEING PROVIDED ON THE BASIS OF YOUR REPORTED NEED, AND SHALL BE CONSIDERED CONFIDENTIAL. BY ACCEPTING THIS DOCUMENT, YOU AGREE THAT IT WILL NOT BE SHARED OR OTHERWISE DISCLOSED TO ANYONE OTHER THAN PERSONS WHO HAVE A DIRECT NEED TO KNOW FOR THE SOLE PURPOSE OF CARRYING OUT THE PROJECT FOR WHICH THIS DOCUMENT WAS OBTAINED. ANYONE RECEIVING THIS DOCUMENT IS BOUND BY THE SAME CONFIDENTIALITY REQUIREMENTS AND MUST TAKE PRECAUTIONS TO PROTECT AGAINST ITS DISSEMINATION.

THE FAILURE TO OBSERVE THE CONFIDENTIALITY REQUIREMENTS OF THIS NOTICE SHALL SERVE AS THE BASIS FOR THE CITY OF CINCINNATI TO IMMEDIATELY SEEK LEGAL RECOURSE, INCLUDING THE RECOVERY OF ACTUAL DAMAGES RESULTING FROM UNAUTHORIZED ACCESS OR DISCLOSURE OF THIS DOCUMENT.

6800 RIVER ROAD
FAIRFIELD, OH 45014



LOCATION PLAN
NOT TO SCALE

N

UNDERGROUND UTILITIES

2 WORKING DAYS
BEFORE YOU DIG
Call 800–362–2764 (Toll Free)
OHIO UTILITIES PROTECTION SERVICE

NON MEMBERS
MUST BE CALLED DIRECTLY

UTILITIES

GREATER CINCINNATI WATER WORKS

4747 SPRING GROVE AVENUE
CINCINNATI, OHIO 45232
CONTACT: MR. MARK NEIHE
PHONE: (513) 591–7870

DUKE ENERGY COMPANY

COMMERCIAL GAS AND ELECTRIC
CUSTOMER PROJECT COORDINATOR
CONTACT: MR. JOE HEUNEFELD
PHONE: (513) 287–1427

INDEX OF DRAWINGS

SHEET	DRAWING NO.	TITLE
1	G-001	COVER
		WATER TREATMENT PLANT
2	DD-101	DEMOLITION PLAN INTERMEDIATE FLOOR @ EL. 567.25
3	DD-102	DEMOLITION PLAN OPERATING FLOOR @ EL. 579.00
4	S-501	DETAILS AND NOTES
		HVAC
5	H-101	HVAC PLAN AND SECTION @ EL. 579.00
		ELECTRICAL
6	E-001	LEGEND AND ABBREVIATIONS SHEET 1
7	E-002	LEGEND AND ABBREVIATIONS SHEET 2
8	E-101	ELECTRICAL PLAN INTERMEDIATE FLOOR @ EL. 567.25
9	E-102	ELECTRICAL PLAN OPERATING FLOOR @ EL. 579.00
10	E-103	ELECTRICAL PLAN BASEMENT FLOOR @ EL. 554.50
11	E-104	GROUNDING AND BONDING PLAN
12	E-501	INSTALLATION DETAILS
13	E-601	PLANT ONE-LINE DIAGRAM DEMOLITION
14	E-602	PLANT ONE-LINE DIAGRAM PROPOSED
15	E-603	EXISTING INDOOR SWITCHGEAR COMPARTMENTS 4 & 10 DEMOLITION
16	E-604	EXISTING INDOOR SWITCHGEAR COMPARTMENTS 4 & 10 MODIFICATIONS
17	E-605	HIGH SERVICE PUMPS NO. 3 & 4 VFD WIRING DIAGRAM
18	E-606	MCC-B1 SINGLE-LINE / LOAD TABLE MCC ELEVATION
19	E-607	MCC-P1 SINGLE-LINE / LOAD TABLE MCC ELEVATION

CONTRACTS
1. ELECTRICAL

BOLTON WATER TREATMENT PLANT
VFD AND MOTOR IMPLEMENTATION
GREATER CINCINNATI WATER WORKS
GCWW CIP NO. 153338, WW–002830

OCTOBER 2015

SEALING OF DOCUMENTS

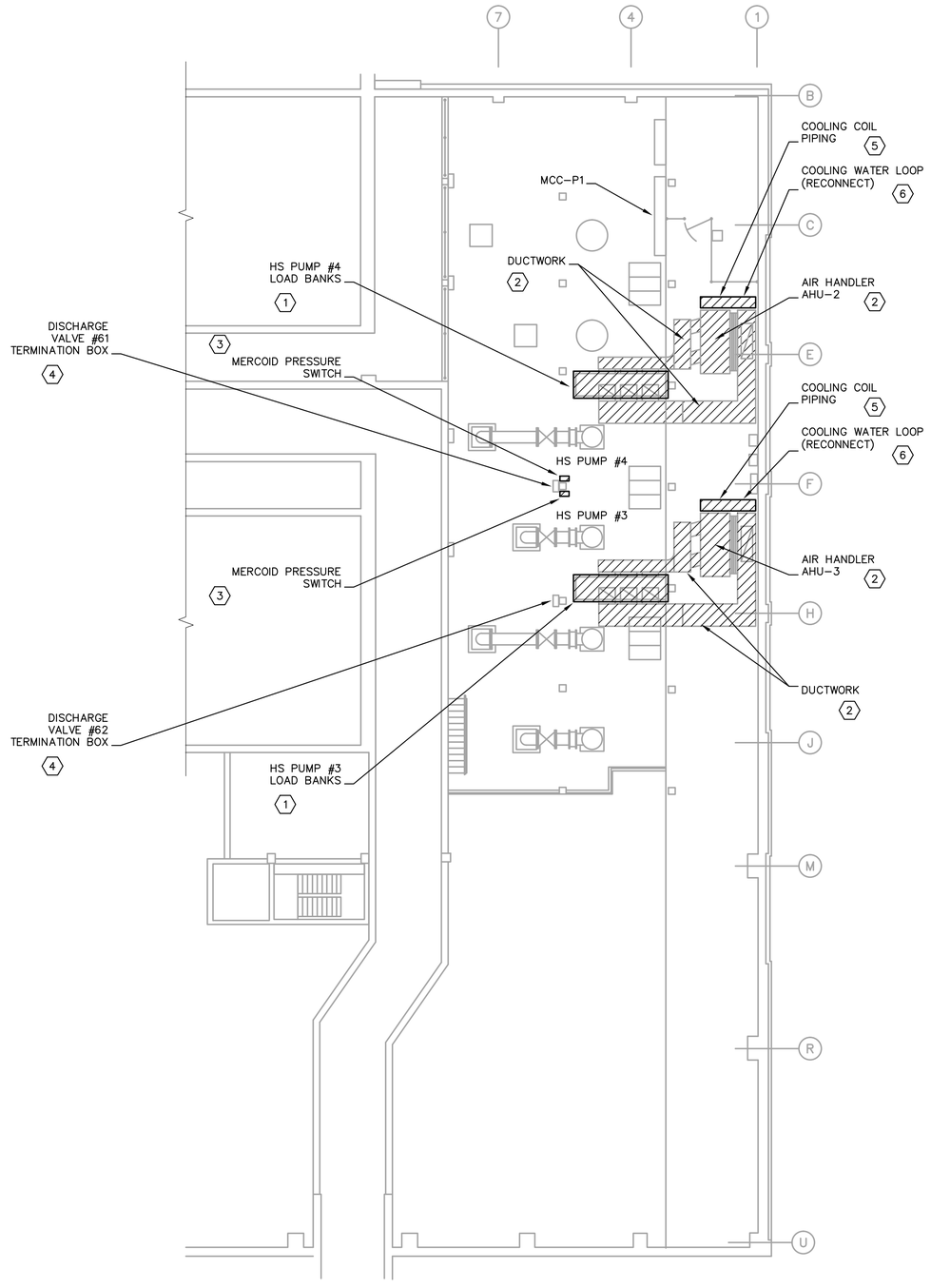
		SHEETS CERTIFIED
STATE OF OHIO JASON M. ABBOTT E-73118 REGISTERED PROFESSIONAL ENGINEER 12/10/15	NAME: JASON M. ABBOTT, P.E. DATE: 12/10/2015	SHEETS: GENERAL AND DEMOLITION
STATE OF OHIO Matthew A. Palte #E-68671 REGISTERED PROFESSIONAL ENGINEER 12-10-2015	NAME: MATTHEW A. PALTE, P.E. DATE: 12/10/2015	SHEETS: STRUCTURAL
STATE OF OHIO Daniel James Ocharzak #E-69071 REGISTERED PROFESSIONAL ENGINEER 12/10/15	NAME: DANIEL J. OCHARZAK, P.E. DATE: 12/10/2015	SHEETS: HVAC
STATE OF OHIO ROBERT JAMES SMITH II 72643 REGISTERED PROFESSIONAL ENGINEER 12/14/15	NAME: ROBERT J. SMITH II, P.E. DATE: 12/14/2015	SHEETS: ELECTRICAL

ARCADIS
ARCADIS U.S. Inc.
4665 Cornell Road
Cincinnati, Ohio 45241
Tel: 513–860–8700 Fax: 513–860–8701
www.arcadis–us.com

AUTOMATED SYSTEMS ENGINEERING

Ohio EPA
Ohio Environmental Protection Agency
"Self-Certification" letter required prior to the start of construction.
☐ OEPA CERTIFICATION EXEMPT

JEFFREY PIEPER, P.E.
SUPERINTENDENT OF WATER SUPPLY
GREATER CINCINNATI WATER WORKS



PLAN AT EL 567.25

0 8' 16' 24'

N

GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.
2. BEFORE HAULING DEBRIS OFFSITE, SCRAP METAL AND OTHER APPLICABLE MATERIALS SHALL BE SEPARATED AND RECYCLED.
3. BID PACKAGE "B" IS RESPONSIBLE FOR DEMO AND REMOVAL OF AIR HANDLERS AND DUCT WORK.
4. BID PACKAGE "A" SHALL DISCONNECT AIR HANDLER IN PREPARATION FOR DEMO AND PERFORM ALL OTHER WORK NOT REQUIRED IN BID PACKAGE "B".

(X) SHEET KEYNOTES:

1. REMOVE LOAD BANK CABINETS AND ALL CABLES AND CONDUIT TO THE SWITCHGEAR COMPARTMENT AND MOTOR. REMOVE VENTILATION DUCTWORK. GCWW SHALL RETAIN OWNERSHIP OF THE FOLLOWING SALVAGE ITEMS: RESISTOR BANKS, DRUM SWITCH, AND CABLES. CONTRACTOR SHALL RELOCATE SALVAGE ITEMS TO A STORAGE FACILITY ONSITE. AREAS OF EQUIPMENT DEMOLITION SHALL BE RESTORED AFTER REMOVAL, INCLUDING CLEAN-UP AND PATCHING OF FLOORS AND OPENINGS. REMOVE CONTROL WIRING FROM DRUM SWITCH BACK TO RTU. CONDUIT RUN TO THE RTU WILL BE REUSED FOR NEW WIRING TO THE EXTENT POSSIBLE. RTU CONDUIT RUNS THAT ARE NOT REUSED SHALL BE CAPPED. REMOVE VENTILATION DUCTWORK BACK TO AIR HANDLING UNITS.
2. CONTRACTOR SHALL REMOVE AIR HANDLING UNITS AHU-2 AND AHU-3 AND ASSOCIATED DUCTWORK. REMOVE ALL AIR HANDLER CABLE AND CONDUITS FROM THE AHUs TO MCC-P1 AND ALL CONDUIT AND WIRING AROUND THE UNITS FOR MOTORIZED DAMPERS, FAN MOTORS, DUCT SWITCHES, THERMOSTATS, SOLENOIDS, AND ALL APPURTENANCES.
3. DISCONNECT AND REMOVE EXISTING MERCOID DIFFERENTIAL PRESSURE SWITCHES. DO NOT DAMAGE MERCOID SWITCHES DURING REMOVAL – MERCOID SWITCHES CONTAIN MERCURY. CONTRACTOR SHALL DISPOSE OF SWITCHES IN ACCORDANCE WITH EPA RCRA REQUIREMENTS AND PROVIDE SHIPMENT AND DISPOSAL DOCUMENTATION TO GCWW.
4. REMOVE CONTROL CONDUITS AND WIRING FROM DISCHARGE VALVE TERMINATION BOX AND PRESSURE SWITCHES TO SWITCHGEAR CABINETS FOR HS PUMPS NO. 3 & 4.
5. DRAIN AND REMOVE ALL COOLING COIL PIPING ASSOCIATED WITH AHU-2 AND AHU-3 FROM THIS BUILDING LEVEL. DRAIN AND REMOVE PIPING BELOW SLAB TO THE EXTENT REQUIRED TO TIE THE SUPPLY WATER AND RETURN WATER TOGETHER.
6. RECONNECT 2-1/2" COOLING WATER SUPPLY AND RETURN PIPING BELOW SLAB. PROVIDE 2-1/2" BELL & GOSSETT CIRCUIT SETTER BALANCE VALVE IN TIE-IN RECONNECTION PIPE. ADJUST AS REQUIRED TO RETURN PUMPS TO ORIGINAL OPERATING POINT AND PROVIDE 60 GPM THROUGH LOOP. PIPING AND INSULATION TO MATCH EXISTING MATERIAL AND INSTALLATION. PAINT PIPING TO MATCH EXISTING.

ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

AUTOMATED SYSTEMS ENGINEERING

SEALS

STATE OF OHIO
ROBERT JAMES SMITH
72643
REGISTERED
PROFESSIONAL ENGINEER

12/14/15

city of CINCINNATI
GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT H.S. PUMPS 3 & 4 VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA-300-05X0015
FILE NAME: BWTP-DD-101
DESIGNED BY: R. SMITH
DRAWN BY: M. MATSON
CHECKED BY: J. STEED

SHEET TITLE

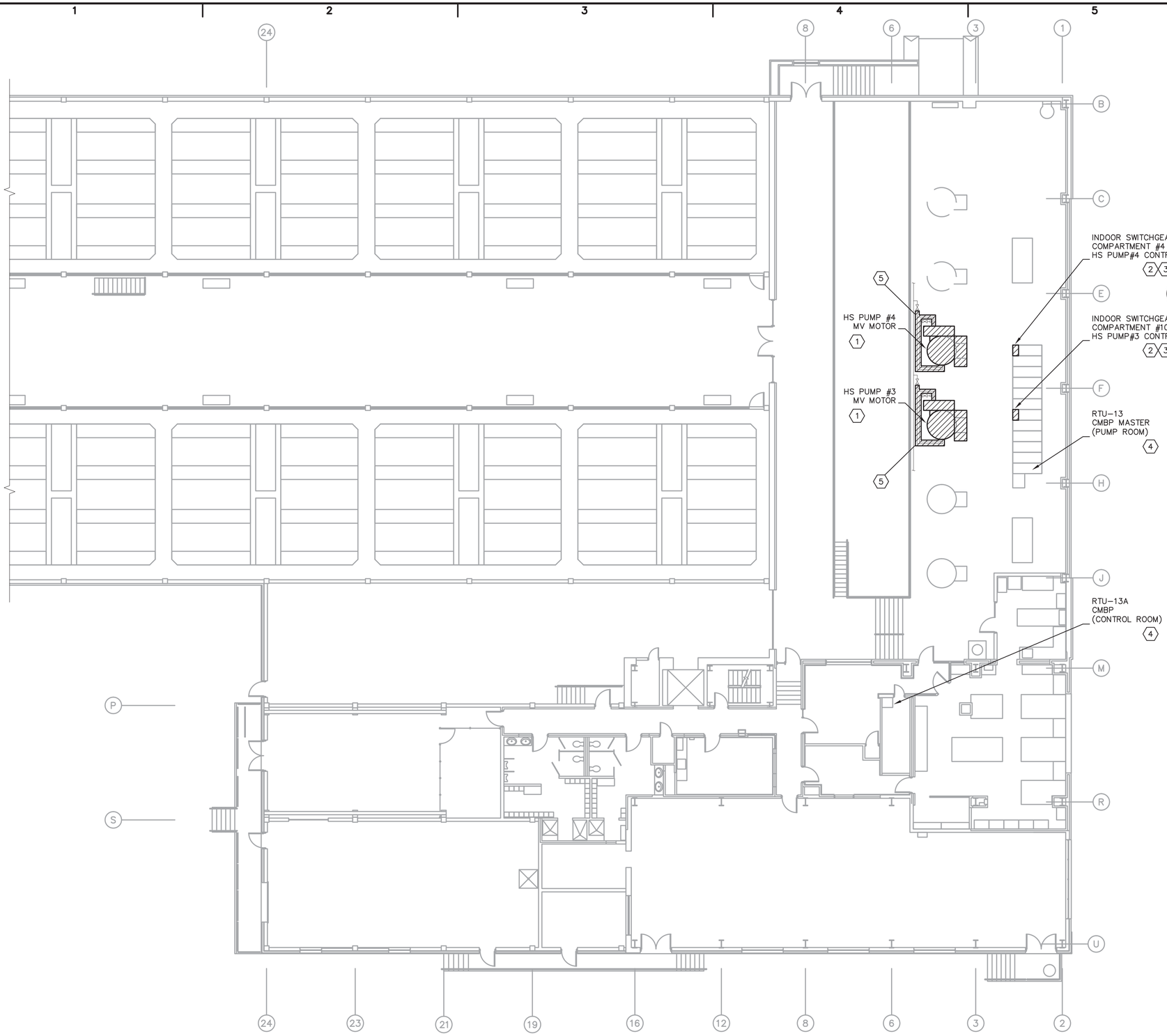
GENERAL

DEMOLITION PLAN INTERMEDIATE FLOOR @ EL. 567.25

SCALE: AS SHOWN

DD-101

SHEET 2 OF 19



PLAN AT EL 579.00

GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.
2. BEFORE HAULING DEBRIS OFFSITE, SCRAP METAL AND OTHER APPLICABLE MATERIALS SHALL BE SEPARATED AND RECYCLED,

(X) SHEET KEYNOTES:

1. UNCOUPLE AND REMOVE EXISTING G.E. 1500 HP MOTOR, INCLUDING BOXES AND ENCLOSURES, CABLE AND CONDUIT FROM MOTOR TO LOAD BANK AND SWITCHGEAR CABINET. REMOVE POWER, CONTROL AND RTD CABLES. GCWW SHALL RETAIN OWNERSHIP OF MOTORS. RELOCATE TO A STORAGE LOCATION DESIGNATED BY GCWW.
2. BEFORE REMOVING CONTROL WIRING, IDENTIFY, VERIFY, AND LABEL WIRING FROM EXISTING FIELD DEVICES, ESPECIALLY THOSE ITEMS IN THE INDOOR SWITCHGEAR COMPARTMENT TO BE RE-CONNECTED TO THE NEW VFDs. COORDINATE ALL RTU CABINET WIRING ACTIVITY (DEMOLITION/TERMINATIONS) WITH GCWW.
3. AFTER DEMOLITION OF LOAD BANK FEEDER CABLES, REMOVE CURRENT TRANSFORMERS (CTs) AND PUMP CONTROL RELAYS AND WIRING. SALVAGE CTs AND TURN OVER TO GCWW.
4. REMOVE SCADA CONTROL WIRING FROM SWITCHGEAR COMPARTMENTS 4 & 10 TO RTU-13 AND RTU-13A PANELS. CONDUIT SHALL REMAIN FOR REUSE.
5. REMOVE POTABLE WATER SUPPLY (BLUE) AND DRAIN (GREEN) PIPING ASSOCIATED WITH MOTOR BEARING COOLING WATER FROM ISOLATION VALVES ON MEZZANINE LEVEL THROUGH TO THE MOTOR. VALVES AT FLOOR LEVEL SHALL REMAIN. PVC DRAIN HEADER ALONG CURB, SERVICING OTHER PUMPS, SHALL REMAIN. UNBOLT AND REMOVE FLOOR STANDS WHERE PIPING HAS BEEN REMOVED.

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ARCADIS U.S., INC.

CONSULTANTS

AUTOMATED SYSTEMS ENGINEERING

SEALS

STATE OF OHIO
ROBERT JAMES SMITH
72643
REGISTERED
PROFESSIONAL ENGINEER

10/26/15

city of CINCINNATI

GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT H.S. PUMPS 3 & 4 VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA-300-05X0015
FILE NAME: BWTP-DD-102
DESIGNED BY: R. SMITH
DRAWN BY: M. MATSON
CHECKED BY: J. STEED

SHEET TITLE

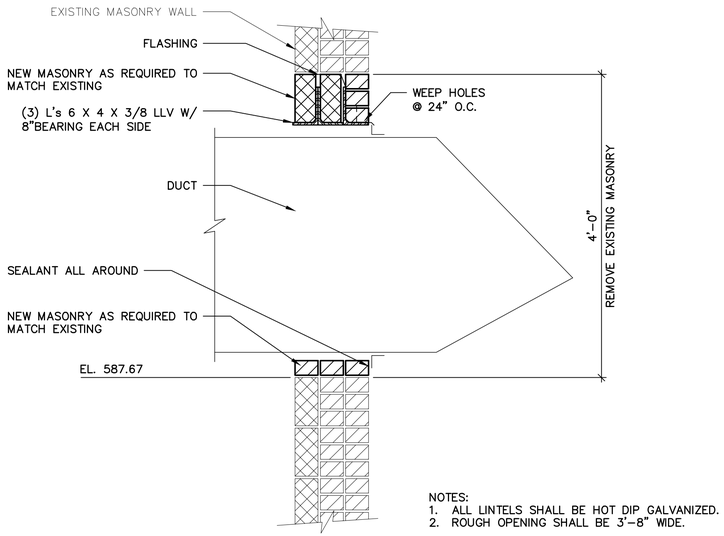
GENERAL

DEMOLITION PLAN OPERATING FLOOR @ EL. 579.00

SCALE: AS SHOWN

DD-102

SHEET 3 OF 19

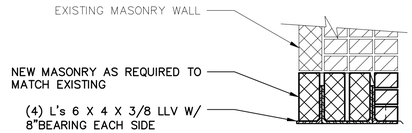


NOTES:
1. ALL LINTELS SHALL BE HOT DIP GALVANIZED.
2. ROUGH OPENING SHALL BE 3'-8" WIDE.

13" WALL SHOWN.
FOR 17" WALL SEE DETAIL 2 / S-501

1 / H-101 DETAIL

1"=1'-0"

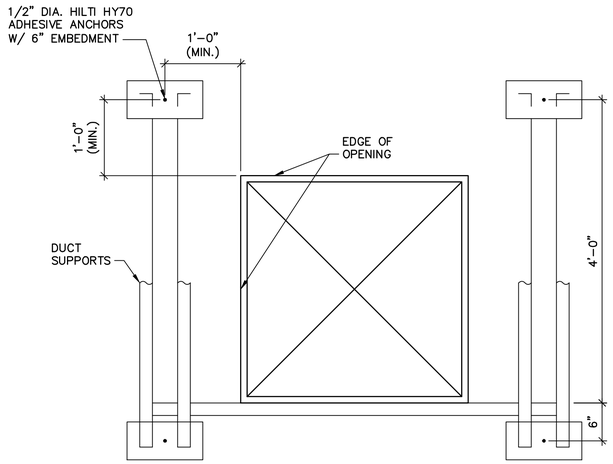


SEE DETAIL 1 / S-501

FOR TYPICAL CONDITIONS NOT SHOWN

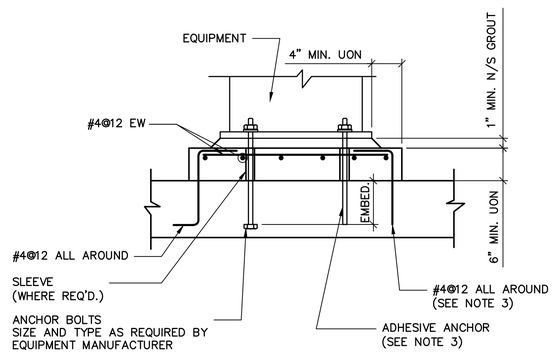
2 / S-501 DETAIL

1"=1'-0"



1 / H-101 SECTION

SCALE: 1"=1'-0"



NOTES:
1. PROVIDE SUPPORT PAD FOR ALL EQUIPMENT UON.
2. COORDINATE LOCATION AND SIZE OF PAD WITH OTHER DISCIPLINES' DRAWINGS AND WITH EQUIPMENT MANUFACTURERS' DRAWINGS.
3. FOR EXISTING SLABS, PROVIDE ADHESIVE ANCHORAGE SYSTEM IN CONFORMANCE WITH EQUIPMENT MANUFACTURERS' REQUIREMENTS.

TYPICAL EQUIPMENT PAD DETAIL

NOT TO SCALE

A. GENERAL NOTES:

1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND EXISTING CONDITIONS.
2. SEISMIC CRITERIA:
   SEISMIC IMPORTANCE FACTOR – Ie=1.5.
   USE GROUP – IV.
   DESIGN CATEGORY – C.
   SITE CLASS – D.
   MAPPED SPECTRAL RESPONSE COEFFICIENTS – Ss=0.141, S1=0.077.
   DESIGN SPECTRAL RESPONSE COEFFICIENTS – Sds=0.15, Sd1=0.123.

B. CONCRETE NOTES:

1. MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS – 4,500 PSI.
2. BAR REINFORCING – ASTM A615 GRADE 60.
3. WELDED WIRE FABRIC REINFORCING – ASTM A185.
4. ALL LAP SPLICES SHALL BE CLASS B OR AS SHOWN.
5. CONCRETE COVER OVER REINFORCING (CAST IN PLACE):

CONCRETE CAST AGAINST EARTH	3"
CONCRETE EXPOSED TO EARTH OR WEATHER:	
#6 BARS AND LARGER	2"
#5 BARS AND SMALLER	1 1/2"
CONCRETE NOT EXPOSED TO EARTH OR WEATHER:	
SLAB, JOIST AND WALL REINFORCING	3/4"
BEAM AND COLUMN PRIMARY REINFORCEMENT, STIRRUPS AND TIES	1 1/2"

6. ALL EQUIPMENT PADS SHALL RECEIVE A TROWEL FINISH AND CHEMICAL HARDENER.
7. BID PACKAGE B IS RESPONSIBLE FOR INSTALLATION OF DUCT WORK, DUCT WORK SUPPORT SYSTEMS, CONSTRUCTION OF ALL EQUIPMENT PADS, AND DEMO/CONSTRUCTION OF DUCT WORK OPENINGS IN EXISTING MASONRY WALLS. DETAILS FOR HVAC CANTILEVER SUPPORT SYSTEMS AND TEMPORARY SHORING FOR MASONRY OPENINGS SHALL BE SUBMITTED FOR APPROVAL BY PROFESSIONAL ENGINEER.

ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

SEALS

STATE OF OHIO
Matthew A. Palte
#E-68671
REGISTERED PROFESSIONAL ENGINEER
12-10-2015

city of CINCINNATI
GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT
H.S. PUMPS 3 & 4
VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA-300-05X0015
FILE NAME: S-501
DESIGNED BY: DiCORSO
DRAWN BY: DiCORSO
CHECKED BY:

SHEET TITLE

STRUCTURAL

DETAILS AND NOTES

SCALE: AS SHOWN

S-501

SHEET 4 OF 19

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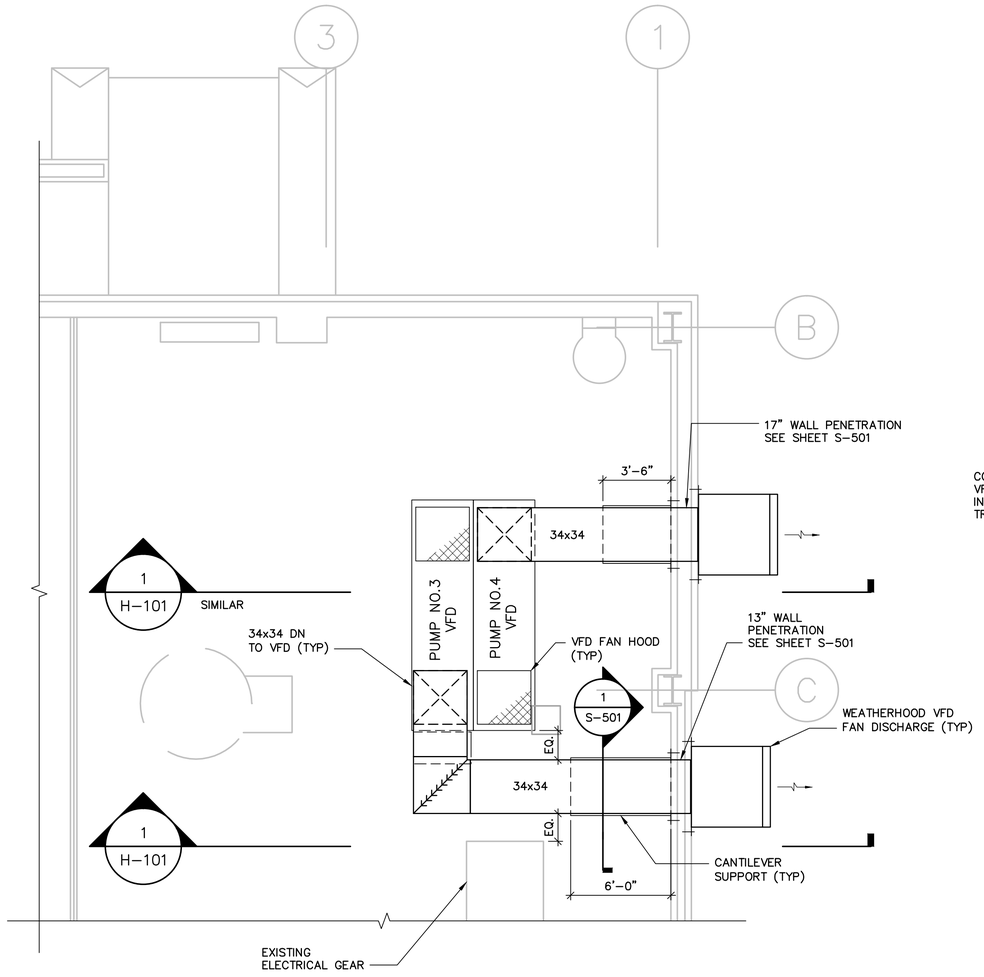
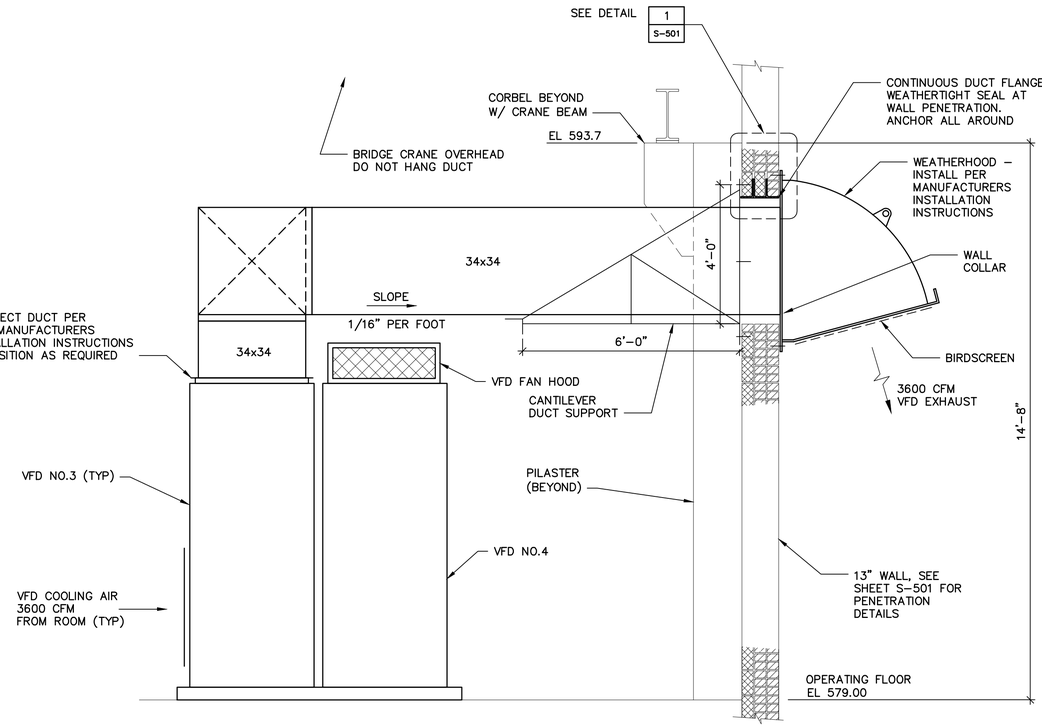


PARTIAL PLAN AT EL 579.00

SCALE: 1/4"=1'-0"



1 H-101 SECTION

SCALE: 1/2"=1'-0"

A. GENERAL NOTES:

1. BID PACKAGE B IS RESPONSIBLE FOR PURCHASE AND INSTALLATION OF ALL DUCT WORK AND DUCT WORK APPURTENANCES SHOWN HERE, INCLUDING WEATHER HOOD AND SCREEN. CONTRACTOR SHALL COORDINATE WITH VFD MANUFACTURER FOR CONNECTIONS TO NEW VFD EQUIPMENT.

2. THE CONTRACTOR SHALL ONLY BE PERMITTED TO CONSTRUCT THE VENTILATION OPENING IN THE EXISTING MASONRY AFTER THE VENTILATION HOOD IS ON-SITE AND READY FOR INSTALLATION. CONTRACTOR SHALL INSTALL THE VENTILATION HOOD IMMEDIATELY AFTER COMPLETING THE CONSTRUCTION OF THE OPENING. CONTRACTOR SHALL BE REQUIRED TO SEAL THE INSIDE OF THE BUILDING AT THE OPENING AFTER IT IS BUILT AND BEFORE THE DUCT WORK IS INSTALLED.

ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

SEALS

STATE OF OHIO
Daniel James Ocharzak
PE-69071
REGISTERED PROFESSIONAL ENGINEER
12/10/15

city of CINCINNATI
GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT
H.S. PUMPS 3 & 4
VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA-300-05X0015
FILE NAME: H-101
DESIGNED BY: D. OCHARZAK
DRAWN BY: B. MEISTER
CHECKED BY:

SHEET TITLE

HVAC

HVAC PLAN AND SECTION @ EL. 579.00

SCALE: AS SHOWN

H-101

SHEET 5 OF 19

User: JFOGLE Spec: AUS-NCSMOD File: G:\PROJECTS\00663102.0001_GCWW_BOLTON_DESIGN\16 CADD\100% SUBMITTAL\HVAC\H-101.DWG Scale: 1:1 SavedDate: 12/10/2015 Time: 14:10 Plot Date: Fogle, Jeff; 12/10/2015, 14:11 ; Layout: H-101

GENERAL LINEWORK:

- NEW WORK
- EXISTING TO REMAIN
- EXISTING TO BE REMOVED
- (1) KEY NOTE DESIGNATOR. REFERENCE CORRESPONDING KEY NOTE ON THE DRAWING

PLAN DRAWINGS:

- GROUND ROD
- GROUND ROD AND WELL
- LIGHTNING ROD
- GROUND CONNECTION
- —GR —GR— GROUNDING CONDUCTOR
- —L —L— LIGHTNING CONDUCTOR
- G EQUIPMENT GROUND PLATE
- (#) LOAD: MOTOR, MOTORIZED VALVE, ETC.
- JB JUNCTION BOX
- NEMA XX AREA NEMA DESIGN RATING
- XXX LOCAL CONTROL DEVICE, CONTROL LOCATION
- DISC LOCAL DISCONNECT

DISTRIBUTION EQUIPMENT SYMBOLS:

GENERAL:
APPROXIMATE SHAPE AND SCALE REPRESENTED – EXACT SIZE AND NUMBER OF SECTIONS IS ESTIMATED.

FLOOR–STANDING DISTRIBUTION ASSEMBLY, SUCH AS A SWITCHBOARD, TRANSFORMER, OR MOTOR CONTROL CENTER

MCC–1A EQUIPMENT NUMBER (EXAMPLE)

WALL–MOUNTED DISTRIBUTION ASSEMBLY, SUCH AS PANELBOARD, MOTOR STARTER PANEL, OR TERMINAL CABINET

PP–1A EQUIPMENT NUMBER (EXAMPLE)

PLAN DRAWINGS:

CIRCUIT AND RACEWAY SYMBOLS:

- RACEWAY OR WIRING SYSTEM ABOVE FLOOR LEVEL BELOW CEILING, EXPOSED UON.
- RACEWAY OR WIRING SYSTEM IN OR UNDER FLOOR, OR CONCEALED IN OR BEHIND STRUCTURE OR EQUIPMENT, OR CONDUIT ROUTED BELOW GRADE IN CONCRETE ENCASEMENT.
- RACEWAY OR WIRING SYSTEM TURNED TOWARD THE VIEWER (UP ON PLAN DRAWINGS)
- RACEWAY OR WIRING SYSTEM TURNED AWAY FROM THE VIEWER (DOWN ON PLAN DRAWINGS)
- RACEWAY OR WIRING SYSTEM CHANGE IN ELEVATION OR DISTANCE FROM VIEWER
- CONDUIT STUB AND CAP
- SHH23 SIGNAL (S), LOW VOLTAGE (L), OR MEDIUM VOLTAGE (M), HANDHOLE (HH) OR MANHOLE (MH) WITH DESIGNATION. EXAMPLE: SIGNAL HANDHOLE NUMBER 23.
- JB 2700A (J) JUNCTION BOX WITH OPTIONAL IDENTIFIER.
- (J) JUNCTION BOX, WALL MOUNTED.
- TB 1035 (TB) TERMINAL BOX WITH OPTIONAL IDENTIFIER EXAMPLE: TERMINAL BOX #1035
- (X) CALL–OUT FOR CONDUCTOR AND CONDUIT SCHEDULE
- GAS DETECTOR
- SMOKE DETECTOR

LIGHTING – FLUORESCENT/LED FIXTURES:

- SUSPENDED PENDANT MOUNTED FIXTURE OR RECESSED / SURFACE MOUNTED

LIGHTING – INCANDESCENT/HID FIXTURES:

- RECESSED, SURFACE OR PENDANT
- WALL MOUNTED
- POLE–MOUNTED AREA LIGHT
- EMERGENCY LIGHTING UNIT, SELF–CONTAINED "X" SHALL INDICATE COMBINATION EXIT/EMERGENCY FIXTURE

WIRING DEVICE SYMBOLS:

SWITCHES

GENERAL:
UNLESS OTHERWISE NOTED, WIRING DEVICES SHALL BE WALL MOUNTED. FOR MOUNTING HEIGHT SEE SPECS.

- $ SINGLE POLE SWITCH.
- $$ GANG SWITCHES––IN COMMON BOX, WITH COMMON WALL PLATE
- $a,3 SWITCH SUPERSCRIPT MODIFIER. LOWER CASE LETTER. INDICATES CIRCUIT CONTROLLED––a,b,c,etc. MAY BE COMBINED WITH CIRCUIT NUMBER. EXAMPLE: 1a, 4b
- SWITCH SUBSCRIPT MODIFIER. UPPER CASE LETTER OR NUMBER:
  - 2 = DOUBLE POLE
  - 3 = THREE WAY
  - 4 = FOUR WAY
  - K = KEY OPERATED
  - M = HORSEPOWER RATED MANUAL STARTER
  - MC = MOMENTARY CONTACT, THREE POSITION
  - MS = MANUAL (MOTOR) STARTER OR SWITCH
  - R = RHEOSTAT (DIMMER, SPEED CONTROL)
  - F = FLUSH MOUNTED

RECEPTACLES:

- 3 GF 20 AMP RECEPTACLE; SINGLE STROKE – SINGLE DOUBLE STROKE – DUPLEX.

RECEPTACLE MODIFIERS:
- 3 = CIRCUIT NUMBER
- C = CLOCK HANGER
- GF = GROUND FAULT CIRCUIT INTERRUPTER
- F = FLUSH MOUNTED

- 480V RECEPTACLE
- 10–50R SPECIAL RECEPTACLE. RATING OR NEMA CONFIGURATION AS SHOWN. EXAMPLE: NEMA 10–50R
- GANGED RECEPTACLES––IN COMMON BOX, WITH COMMON WALL PLATE. eg DUPLEX

LIGHTING – EXIT SIGNS:

- WALL MOUNTED. (DARK QUADRANTS INDICATE FACES ILLUMINATED)
- WITH DIRECTIONAL ARROWS

LIGHTING – CONTROL AND CIRCUITING:

- NL LP–1C–3 LIGHTING CIRCUIT IDENTIFIER: INDICATES PANEL AND CIRCUIT NUMBER (EX. LIGHTING PANEL 1C, CIRCUIT 3). NL = NIGHT LIGHTS (ALWAYS ON) – FROM UNSWITCHED POWER SOURCE.
- (MO) / (PCU) MOTION SENSOR / PHOTOCELL CONTROL UNIT

GENERAL ABBREVIATIONS:

3/C	THREE CONDUCTOR CABLE	CNTL	CONTROL	GDR	GROUNDING RESISTOR	kCMIL	1000 CIRCULAR MIL	MTS	MANUAL TRANSFER SWITCH	PRI	PRIMARY	TB	TERMINAL BOX
A, AMP	AMPERE(S)	CR	CONTROL RELAY	GEC	GROUNDING ELECTRODE CONDUCTOR	kV	KILOVOLT	PS	POWER SUPPLY	TC	TIMED–CLOSED
AC	ALTERNATING CURRENT	CS	CONTROL STATION			kVA	KILOVOLT–AMPERE	MV	MILLIVOLT, MEDIUM VOLTAGE	PT	POTENTIAL TRANSFORMER	TEL	TELEPHONE
ACC	AREA CONTROL CENTER	CT	CURRENT TRANSFORMER	GF	GROUND FAULT	kVAR	KILOVOLT–AMPERE REACTIVE	MVMC	MEDIUM VOLTAGE MOTOR CONTROL	PTT	PUSH TO TEST	TEMP	TEMPERATURE
AFF	ABOVE FINISHED FLOOR	CU	COPPER	GFI	GROUND FAULT INTERRUPTER	kW	KILOWATT			PVC	POLYVINYL CHLORIDE	TFR	TRANSFORMER
AHU	AIR HANDLING UNIT			GND, G	GROUND	kWH	KILOWATT–HOUR			PWR	POWER	TO	TIMED OPEN
AIC	AMPS INTERRUPTING CAPACITY, SYMM.	DB	DUCT BANK, BURIED	GO	GATE OPERATOR			N/A	NOT APPLICABLE			TP	TWISTED PAIR, MOTOR TEST PORT
AL	ALUMINUM	DC	DIRECT CURRENT, DATA CABLE	GRS	GALVANIZED, RIGID STEEL	L	LONG	NC	NORMALLY CLOSED	RCPT	RECEPTACLE	TR	TIME DELAY RELAY
AM	AMP METER	DCU	DISTRIBUTED CONTROL UNIT			LA	LIGHTNING ARRESTOR	NEUT, N	NEUTRAL	RCS	REMOTE CONTROL STATION	TRI	TRIAD
ANN	ANNUNCIATOR			H	HIGH	LCP	LOCAL CONTROL PANEL	NF	NON–FUSED	REF	REFERENCE	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
ARCH	ARCHITECTURAL	DET	DETAIL	HGT	HEIGHT	LCS	LOCAL CONTROL STATION	NIC	NOT IN CONTRACT	REQD	REQUIRED	TYP	TYPICAL
ARMS	ARC–REDUCTION MAINTENANCE SYSTEM	DIAG	DIAGRAM	HH	HANDHOLD	LOR	LOCAL–OFF–REMOTE	NO	NORMALLY OPEN, NUMBER	REV	REVERSE		
ARV	AUTO TRANSFORMER REDUCED VOLTAGE STARTER	DISC	DISCONNECT	HID	HIGH INTENSITY DISCHARGE	LORR	LOCAL–OFF–REMOTE–RESET	NOM	NOMINAL	RMS	ROOT MEAN SQUARE	U/G	UNDERGROUND
		DWG	DRAWING	HIM	HUMAN INTERFACE MODULE	LP	LEGEND PLATE	NP	NAMEPLATE	RTD	RESISTANCE TEMPERATURE DETECTOR	UPS	UNINTERRUPTABLE POWER SUPPLY
AS	AMP SENSOR	EA	EACH			LS	LONG TIME, SHORT TIME	NTS	NOT TO SCALE	RTU	REMOTE TERMINAL UNIT	US	UNDER–SPEED SWITCH
ASYM	ASYMMETRICAL	ECP	EQUIPMENT CONTROL PANEL	HOA	HAND–OFF–AUTO	LSI	LONG TIME, SHORT TIME, INSTANTANEOUS	OC	ON CENTER	SC	SURGE CAPACITOR	UTP	UNSHIELDED TWISTED PAIR
ATC	AUTOMATIC TRANSFER CONTROLLER	EL	ELEVATION	HOR	HAND–OFF–REMOTE	LT	LONG TIME	OCC	OPERATION CONTROL CENTER	SCH	SCHEDULE		
ATS	AUTOMATIC TRANSFER SWITCH	ELEC	ELECTRIC(AL)	HP	HORSEPOWER	LTG	LIGHTING	OD	OUTSIDE DIAMETER	SE	SERVICE ENTRANCE	V	VOLT
AUTO	AUTOMATIC	EMER	EMERGENCY	HPS	HIGH PRESSURE SODIUM	LV	LOW VOLTAGE	OH	OVERHEAD	SEC	SECONDARY	VA	VOLTAMPERE, VALVE ACTUATOR
AUX	AUXILIARY	ENCL	ENCLOSURE / ENCLOSED	HS	HAND SWITCH			OIS	OPERATOR INTERFACE STATION	SEL	SELECTOR	VAC	VOLTAGE–ALTERNATING CURRENT
AWG	AMERICAN WIRE GAUGE	EO	ELECTRONICALLY OPERATED	HTR	HEATER	M	METER	OL	OVERLOAD	SLC	SINGLE–LOOP CONTROLLER	VAR	VOLTAMPERE REACTIVE
		EPI	EMERGENCY POWER INTERLOCK	HV	HIGH VOLTAGE	MA	MILLIAMPERE	OOR	ON–OFF–REMOTE	SPD	SURGE PROTECTION DEVICE	VC	VACUUM CONTACTOR
BC	BARE COPPER	ETM	ELAPSED TIME METER	HVAC	HEATING, VENTILATION, AND AIR VENTILATION	MBS	MANUAL BYPASS SWITCH	OSC	OPEN–STOP–CLOSE	SPEC	SPECIFICATION	VFD	VARIABLE FREQUENCY DRIVE
BLDG	BUILDING	EQUIP	EQUIPMENT	HZ	HERTZ	MCC	MOTOR CONTROL CENTER	OT	OILTIGHT	SPKR	SPEAKER	VM	VOLT METER
BOT	BOTTOM	EX	EXISTING	IAC	INTERLOCKED ARMOR CABLE	MCP	MOTOR CIRCUIT PROTECTOR	P	POLE, PHASE	SS	START / STOP, STAINLESS STEEL	VS	VOLTAGE SENSOR
C	CONDUCTOR, CONDUIT	EXH	EXHAUST	ID	INSIDE DIAMETER	MECH	MECHANICAL	PB	PUSHBUTTON, PULLBOX	SSOL	SOLID STATE OVERLOAD	VT	VOLTAGE TRANSFORMER
CB	CIRCUIT BREAKER	F	FIELD	IMC	INTERMEDIATE METAL CONDUIT	MFR	MANUFACTURER	PCU	PHOTOCELL CONTROL UNIT	RELAY		W	WATT, WIRE, WIDE
CCA	CONTINUOUSLY CORRUGATED ARMOR	FC	FAIL CLOSE	INS	INCANDESCENT	MH	MANHOLE, METAL HALIDE	PF	POWER FACTOR	ST	SHORT TIME	WH	WATT–HOUR
CKT	CIRCUIT	FDR	FEEDER	INTLK	INTERLOCK	MIC	MICROPHONE	PH	PHASE	STP	SHIELDED TWISTED PAIR	WP	WEATHERPROOF
CLG	CEILING	FL	FLUORESCENT	INST	INSTANTANEOUS	MISC	MISCELLANEOUS	PLC	PROGRAMMABLE LOGIC CONTROLLER	STT	SHIELDED TWISTED TRIAD	XFMR	TRANSFORMER
CM	CENTIMETERS	FLA	FULL LOAD AMPS	INV	INVERT / INVERTED	MM	MILLIMETER	PM	POWER METER / MONITOR	SUB	SUBSTATION	XMTR	TRANSMITTER
CND	CONDUIT	FLEX	FLEXIBLE CONDUIT	I/O	INPUT–OUTPUT	MMH	MEDIUM VOLTAGE MANHOLE	PMM	POWER METERING MODULE	SW	SWITCH	XP	EXPLOSIONPROOF
CONC	CONCRETE	FO	FAIL OPEN, FIBER OPTIC			MO	MOTION SENSOR	PNL	PANEL	SWBD	SWITCHBOARD		
CONF	CONFIRM	FUT	FUTURE	JB	JUNCTION BOX	MOV	MOTOR OPERATED VALVES	PR	PAIR	SWGR	SWITCHGEAR	Z	IMPEDENCE
CPT	CONTROL POWER TRANSFORMER	FVNR	FULL–VOLTAGE NON–REVERSING			MPR	MOTOR PROTECTION RELAY	PRGS	PVC–COATED RIGID GALVANIZED STEEL CONDUIT	SYMM	SYMMETRICAL	ZSI	ZONE–SELECTIVE INTERLOCK
		FWD	FORWARD			MS	MOTOR STARTER			SYS	SYSTEM		

GENERAL & REQUIREMENTS NOTES:

1. SYMBOLS AND ABBREVIATION DRAWINGS ARE GENERAL IN NATURE: NOT ALL SYMBOLS OR ABBREVIATIONS SHOWN ON LEGEND DRAWINGS ARE USED IN SUBSEQUENT DRAWINGS.
2. DEMOLITION WORK SHALL BE IDENTIFIED BY THE GENERAL LINE WORK LEGEND OR BY SPECIFIC REFERENCE ON THE PROJECT DEMOLITION DRAWINGS.
3. DRAWINGS OF EXISTING SYSTEMS ARE BASED ON BEST AVAILABLE RECORD INFORMATION AND SHALL BE FIELD VERIFIED BY CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EXAMINING THE EXISTING FACILITIES TO VERIFY FIELD CONDITIONS AND EQUIPMENT LOCATIONS AND TO DETERMINE THE EXTENT OF THE WORK INVOLVED.
4. NOT ALL CABLES AND CONDUITS ARE SHOWN. CONTRACTOR SHALL BE RESPONSIBLE FOR ROUTING ALL CABLES AND CONDUITS FOR A COMPLETE SYSTEM. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, ALL CABLES AND CONDUITS SHOWN ON THE ELECTRICAL ONE–LINE DIAGRAMS / SINGLE–LINE DIAGRAMS, INSTRUMENTATION SINGLE–LINE DIAGRAMS, SYSTEM ARCHITECTURE DRAWINGS, AND HOME RUNS SHOWN ON PLANS.
5. THE CABLES AND CONDUITS SHOWN ON THE DRAWINGS ARE BASED ON PRELIMINARY INFORMATION FROM EQUIPMENT SUPPLIERS. THE CONTRACTOR SHALL COORDINATE WITH THE EQUIPMENT SUPPLIERS AND SHALL OBTAIN DETAILED SUBMITTAL DRAWINGS FOR ALL OF THE EQUIPMENT. CONTRACTOR SHALL THEN PROVIDE CABLES AND CONDUITS REQUIRED TO WIRE THE EQUIPMENT FURNISHED BY THE EQUIPMENT SUPPLIERS IN THE CONFIGURATION REQUIRED BY THE MANUFACTURER.
6. IF THE EQUIPMENT SUPPLIED BY MANUFACTURER HAS A LARGER LOAD THAN INDICATED ON DRAWINGS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENLARGING THE CABLE, CONDUIT AND ASSOCIATED ELECTRICAL EQUIPMENT, AS REQUIRED, TO ACCOMMODATE THE LARGER LOAD AT NO ADDITIONAL COST TO OWNER.
7. CONTRACTOR SHALL NOTIFY OWNER AND ENGINEER IN WRITING OF ANY EXPECTED INCREASE IN LOADS, PRIOR TO PURCHASING ANY POWER DISTRIBUTION EQUIPMENT OR ASSOCIATED SYSTEMS.
8. CONDUIT SIZES SHOWN ARE THE MINIMUM. ALL CONDUITS SHALL BE SURFACE MOUNTED, EXCEPT AS NOTED. ROUTE ALONG WALLS OR CEILINGS. CONDUIT DROPS TO EQUIPMENT OR LOCAL CONTROL STATIONS SHALL NOT INTERFERE WITH EQUIPMENT REMOVAL OR MAINTENANCE. CABLE AND CONDUITS SHALL BE INSTALLED ACCORDING TO THE SPECIFICATIONS.
9. EQUIPMENT AND FIELD DEVICES SHOWN ARE DIAGRAMMATIC. CONDUITS SHALL BE FIELD ROUTED TO AVOID INTERFERENCES AND PERMIT ROUTINE MAINTENANCE OF EQUIPMENT. IN AREAS WITH OVERHEAD BRIDGE CRANES, HOISTS, ETC., CONDUITS SHALL BE RUN TO AVOID INTERFERING WITH THE OPERATION OF THE EQUIPMENT. CONTRACTOR SHALL INSTALL ALL CABLES AND CONDUITS FOR A COMPLETE SYSTEM, INCLUDING POWER AND CONTROL. CONDUIT SYSTEMS TO EQUIPMENT AND FIELD DEVICES SHALL BE NEW, UNLESS OTHERWISE NOTED ON DRAWINGS.
10. MOTOR CONTROL CENTERS AND PANELS WITH HEIGHT OF 60" OR GREATER SHALL BE MOUNTED ON 3.5" HIGH CONCRETE HOUSEKEEPING PADS. OTHER PANELS SHALL BE RIGIDLY FLOOR OR WALL MOUNTED. FREE STANDING PANELS OR LOCAL CONTROL STATIONS SHALL BE MOUNTED USING 3" CHANNEL STANDS.
11. LIGHTING AND RECEPTACLE CIRCUITS DESIGNATED ON THE PLANS ARE NOT SHOWN ON THE SINGLE–LINE DIAGRAMS. CONDUCTORS FOR LIGHTING, RECEPTACLES, AND MISCELLANEOUS 120VAC CIRCUITS SHALL BE MINIMUM OF 12 AWG WIRING. INSTALLATION SHALL CONFORM TO NEC, AND SHALL BE INSTALLED IN A MINIMUM OF 0.75" CONDUIT. INDOOR LIGHTING FIXTURES SHALL BE INSTALLED AT A NOMINAL HEIGHT OF 10'–0" AFF, UNLESS OTHERWISE NOTED.
12. ALL SPARE CONDUITS SHALL BE CAPPED AT EACH END AND INCLUDE POLY LINE.
13. REGARDING UNDERGROUND WORK – CONTRACTOR IS RESPONSIBLE FOR DETERMINING EXACT LOCATION AND DEPTH OF EXISTING UNDERGROUND UTILITIES IN THE AREAS WHERE NEW WORK SHALL BE PERFORMED OR NEW DUCT BANK INSTALLED. CONTRACTOR SHALL MAKE ADJUSTMENTS TO ROUTING TO AVOID INTERFERENCES AT NO ADDITIONAL COST TO OWNER.
14. CONDUIT WALL AND FLOOR PENETRATIONS INTO DESIGNATED FIRE–RATED ELECTRICAL ROOMS SHALL BE PACKED WITH APPROVED FIRESTOP MATERIAL PER SPECIFICATIONS.
15. IN GENERAL, ABBREVIATIONS USED IN ELECTRICAL DRAWINGS ARE IN ACCORDANCE WITH ANSI Y1.1–1972. ABBREVIATIONS ON THIS SHEET ARE IN ADDITION, OR ARE AMENDMENTS TO ANSI Y1.1–1972 AND ABBREVIATIONS DEFINED ON OTHER DRAWINGS. IN CASE OF CONFLICT THESE ABBREVIATIONS SHALL TAKE PRECEDENCE.
16. MOUNTING TO HANDRAILS FOR SUPPORT OF CONDUIT, ENCLOSURES, OR DEVICES SHALL NOT BE PERMITTED.

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STATE OF OHIO ROBERT JAMES SMITH 72643 REGISTERED PROFESSIONAL ENGINEER
10/26/15

CITY OF CINCINNATI GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT H.S. PUMPS 3 & 4 VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA–300–05X0015
FILE NAME: BWTP–E–001
DESIGNED BY: R. SMITH
DRAWN BY: M. MATSON
CHECKED BY: J. STEED

SHEET TITLE

ELECTRICAL

LEGEND AND ABBREVIATIONS SHEET 1

SCALE: AS SHOWN

E–001

SHEET 6 OF 19

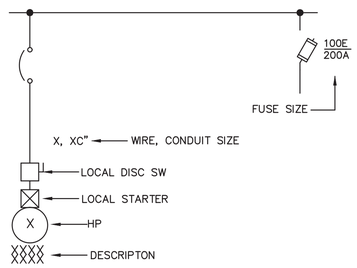
SINGLE LINE DIAGRAMS – 1

- 50AMP/10SEC — NEUTRAL GROUNDING RESISTOR: AMPS/TIME RATING SHOWN
- 5 — MOTOR, HORSEPOWER SHOWN
- MTS10, 60A, 3P — POWER TRANSFER SWITCH. DESIGNATION, AMP RATING AND CONFIGURATION SHOWN. MTS = MANUAL TRANSFER SWITCH; ATS = AUTOMATIC TRANSFER SWITCH
- 1500 KVA, 13.2 KV – 480V, 3ø, 4W — POWER TRANSFORMER. DESIGNATION, SIZE, PRIMARY AND SECONDARY VOLTAGES, AND WINDING CONFIGURATION SHOWN.
- WINDING CONFIGURATION: DELTA
- WYE (GROUNDED)
- GROUND ELECTRODE

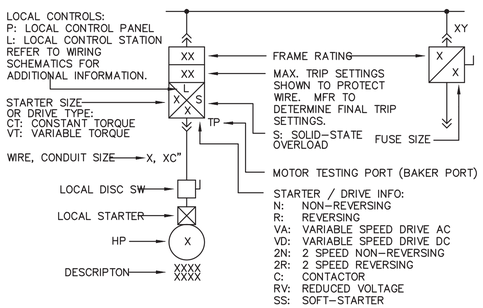
(X) 3/C – XXX w/ GND, 4/C – XXX w/ GND — (QTY) MULTI–CONDUCTOR CABLE, MULTI–CONDUCTOR CABLE

(X) XXX w/ XX GND, 1/C – XXX w/ XX GND — (QTY) SINGLE CONDUCTOR WIRES, SINGLE CONDUCTOR WIRE

POWER PANEL SINGLE–LINE LEGEND



MCC SINGLE–LINE LEGEND



SINGLE LINE DIAGRAMS – 2

- INCOMING POWER SUPPLY
- CABLE TERMINATION. STRESS RELIEF WITH SHIELDED CABLES.
- LIGHTNING ARRESTOR
- SURGE ARRESTOR
- BUS DUCT OR BUSWAY
- STAB OR PULL–APART CONNECTION.
- 52A, 200A — AIR CIRCUIT BREAKER – MOLDED CASE TRIP AND OPTIONAL I.D. SHOWN.
- 3200AF, 2400AT, 52, LSIG — L.V. POWER CIRCUIT BREAKER; TRIP SETTING AND SOLID STATE TRIP FEATURES SHOWN: L = LONG DELAY; S = SHORT DELAY; I = INSTANTANEOUS; G = GROUND FAULT
- 52, 1200A — POWER CIRCUIT BREAKER (AIR (LV), VACUUM (VAC), OR GAS (HV)) FRAME AND TRIP SETTING AND OPTIONAL I.D. SHOWN
- K — KEY INTERLOCK
- MOTOR STARTER, INDIVIDUAL––NOT LOCATED IN AN MCC OR SIMILAR GROUP ASSEMBLY
- COMBINATION MOTOR STARTER––NOT LOCATED IN AN MCC OR SIMILAR ASSEMBLY
- 100A — DISCONNECT OR ISOLATING SWITCH: CONTINUOUS RATING SHOWN. 100A, 3P
- F, OR — FUSED SWITCH: FUSE AND SWITCH CONTINUOUS RATINGS SHOWN
- 100E, 200A — M.V. FUSED CUT–OUT
- 55 KVAR — POWER FACTOR CORRECTION CAPACITOR. KVAR RATING INDICATED
- 2, XXXV – XXXV — VOLTAGE TRANSFORMER PRIMARY AND SECONDARY VOLTAGE CONNECTION SHOWN. QUANTITIES SHOWN.
- 3, 250/5 — CURRENT TRANSFORMER: RATIO, QUANTITIES SHOWN.
- PM — POWER METER
- xS — METER SWITCH, xS: AS = AMMETER SWITCH; VS = VOLTMETER SWITCH; FS = FREQUENCY SWITCH
- A, 0 – 1000 AMPS — METER, WITH OPTIONAL RANGE: A = AMMETER; W = WATTMETER; KWH = KILOWATT–HOUR METER; F = FREQUENCY METER; VAR = VAR METER; V = VOLTMETER
- 64 N, 3 — ANSI C37.2 DEVICE. QUANTITIES SHOWN.
- 600kW, 60 Hz, 480V 3PH,4W — GENERATOR WITH WINDING CONFIGURATION VOLTAGE, POWER, FREQUENCY SHOWN. POWER FACTOR OPTIONAL.
- ELECTRIC HEATER
- POWER OUTLET

CONTROL WIRING DIAGRAMS – 1

LINEWORK:

- CONDUCTORS CONNECTED
- CONDUCTORS NOT CONNECTED
- FIELD WIRING
- MCP — MAGNETIC–ONLY CIRCUIT BREAKER (MCP)
- 15 AMP — CIRCUIT BREAKER, THERMAL–MAGNETIC UNLESS OTHERWISE NOTED
- FU 2B, 15 AMP — FUSE WITH SIZE AND OPTIONAL IDENTIFICATION.
- FU 3/15 AMP — FUSE WITH BLOWN FUSE INDICATOR.
- DISCONNECT SWITCH.
- MTR — MOTOR (PHASES AS REQUIRED)
- SOLENOID VALVE
- 250W — SPACE HEATER, WATTAGE AS INDICATED.
- 480V, 120V, 250VA — CONTROL TRANSFORMER. PRIMARY AND SECONDARY VOLTAGE SHOWN. SIZE OPTIONAL.
- (3), 50/5 — CURRENT TRANSFORMER. PRIMARY/ SECONDARY TURNS RATIO SHOWN (OPTIONAL).
- HORN
- POWER FACTOR CORRECTION CAPACITOR
- PLC I/O POINT
- SURGE PROTECTION DEVICE

INDICATORS:

SHOWN WITH OPTIONAL LEGEND
X = LENS COLOR
A = AMBER; R = RED; B = BLUE; W = WHITE; G = GREEN

- STATUS — DIRECT CONNECTION
- X1 — STATUS — PUSH TO TEST; TEST BUS TERMINAL SHOWN; SHOWN WITH TERMINALS (OPTIONAL)
- TEST — STATUS — REMOTE TEST; TEST BUS TERMINAL SHOWN
- BACK–LIT PUSHBUTTON; SHOWN WITH TERMINALS (OPTIONAL); OPTIONAL IDENTIFIER SHOWN; EXAMPLE :PUSHBUTTON HS 1234

CONTROL WIRING DIAGRAMS – 2

COILS:

SHUNT
- C, LTG CKT #1 — a) CONTACTOR COILS WITH OPTIONAL DESCRIPTION OR REFERENCE. EX: CONTACTOR COIL FOR LTG CKT #1
  - C = CONTACTOR, LTG/GEN USE
  - F = FAST OR FORWARD
  - IC = ISOLATION CONTACTOR
  - M = MAIN OR LINE
  - MO = MOTOR OPERATOR
  - R = RUN OR REVERSE
  - S = SLOW OR START
  - T = TRIP COIL
  - 1M = FIRST MAIN OR WYE
  - 2M = SECOND MAIN OR DELTA
- CR, 10, AUTO ENABLE — b) RELAY COILS WITH NUMERIC PREFIX & OPTIONAL DESCRIPTION OR REF. EXAMPLE: CONTROL RELAY 10 AS AUTO ENABLE.
  - CR = CONTROL RELAY
  - LR = LATCHING RELAY
  - MR = MACHINE TOOL RELAY
  - TR = TIMING RELAY
- TDR, 9, ON or OFF DELAY, RANGE x to xx SEC/MIN, SET AT x SEC/MIN — c) TIME DELAY COIL WITH NUMERIC PREFIX, DELAY ACTION, AND OPTIONAL TIMING RANGE AND SETTING. EXAMPLE: TIME DELAY RELAY TDR9.
- U, L, LR, 8 — d) MECHANICALLY LATCHED RELAY WITH UNLATCH COIL
- SSOL — SOLID STATE OVERLOAD RELAY
- OL — THERMAL OVERLOAD RELAY

METER
- H — METER WITH ALPHA IDENTIFIERS: H = ELAPSED TIME; A = AMMETER; V = VOLTMETER

MAIN CONTACTS
- M, SIZE X — CONTACTOR, NEMA SIZE OPTIONAL.

CONTROL DEVICE LOCATION LEGEND:

- F — FIELD
- CP — LOCAL CONTROL PANEL
- VA — VALVE ACTUATOR
- MS — LOCAL MOTOR STARTER
- LCS — LOCAL CONTROL STATION
- MCC — MOTOR CONTROL CENTER
- VFD — VARIABLE FREQUENCY DRIVE

SWITCH OR INTERLOCK CONTACTS:

NORMALLY OPEN (NO) / NORMALLY CLOSED (NC)

- 12CR, 9CR — CONTROL RELAY CONTACTS WITH NUMERIC PREFIX AND OPTIONAL REF OR DESCRIPTION.
- 3TR, TC; 4TR, TO — ON DELAY (DELAY ON COIL ENERGIZATION) RELAY CONTACTS WITH NUMERIC PREFIX AND OPTIONAL REF OR DESCRIPTION. TC = NORMALLY OPEN, TIME CLOSE. TO = NORMALLY CLOSED, TIME OPEN.
- 5TR, TO; 6TR, TC — OFF DELAY (DELAY ON COIL DE–ENERGIZATION) RELAY CONTACTS WITH NUMERIC PREFIX AND OPTIONAL REF OR DESCRIPTION. TO = NORMALLY OPEN, TIME OPEN. TC = NORMALLY CLOSED, TIME CLOSE.
- 5TR, INST; 6TR, INST — TIME DELAY RELAY INSTANTANEOUS CONTACTS WITH NUMERIC PREFIX AND OPTIONAL REF OR DESCRIPTION.

CONTROL WIRING DIAGRAMS – 3

SWITCHES:

NORMALLY OPEN (NO) / NORMALLY CLOSED (NC)

- 5ZS, 1ZS — LIMIT: FREE
- 3ZS, 7ZS — LIMIT: HELD
- FS3, FS3 — FLOW
- TS1, TS1 — TEMPERATURE
- PS1, PS1 — PRESSURE
- LS5, LS5 — LEVEL
- WS2, WS2 — FORCE OR TORQUE
- SS1, SS1 — SPEED
- HSxxx, HSxxx — MANUAL: MOMENTARY PUSHBUTTON
- STOP — MANUAL: MUSHROOM HEAD MOMENTARY PUSHBUTTON (E–STOP) – RED
- OFF, ON, DESCRIPTION — MANUAL: MAINTAINED PUSHBUTTON OR ROCKER SWITCH
- 1, 2, OX — MANUAL: SELECTOR SWITCH 2 POSITION MAINTAINED. SWITCH POSITION X = CLOSED CONTACT; 0 = OPEN CONTACT
- 1, 2, XO, OX — MANUAL: SELECTOR SWITCH 2 POSITION SPRING RETURN TO RIGHT. SWITCH POSITION X = CLOSED CONTACT; 0 = OPEN CONTACT
- 1, 2, 3, XOO, OOX — MANUAL: SELECTOR SWITCH 3 POSITION. SWITCH POSITION X = CLOSED CONTACT; 0 = OPEN CONTACT
- PLC DISCRETE INPUT
- PLC DISCRETE OUTPUT

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AUTOMATED SYSTEMS ENGINEERING

SEALS

STATE OF OHIO — ROBERT JAMES SMITH — 72643 — REGISTERED PROFESSIONAL ENGINEER
10/26/15

city of CINCINNATI — GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT H.S. PUMPS 3 & 4 VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA–300–05X0015
FILE NAME: BWTP–E–002
DESIGNED BY: R. SMITH
DRAWN BY: M. MATSON
CHECKED BY: J. STEED

SHEET TITLE

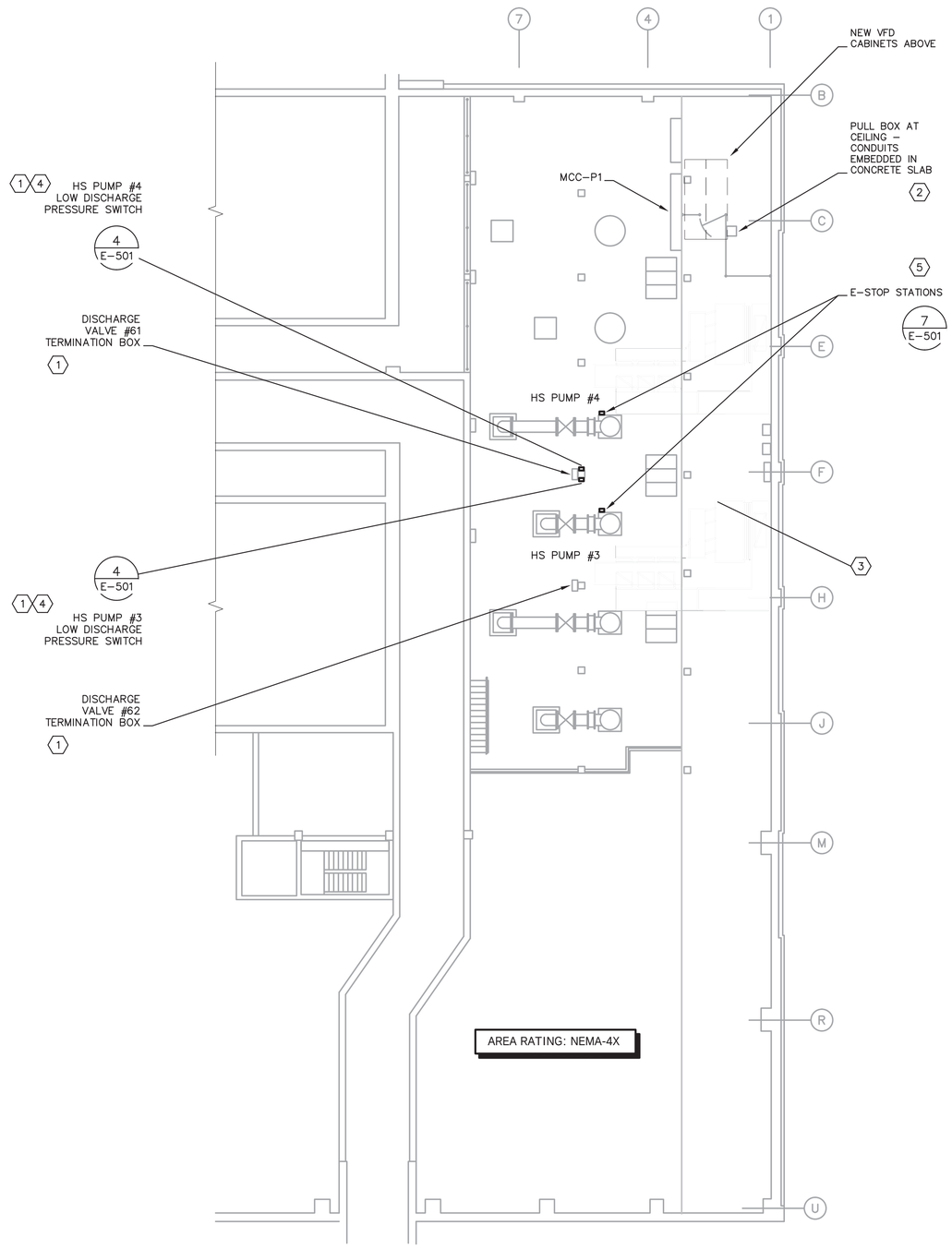
ELECTRICAL

LEGEND AND ABBREVIATIONS SHEET 2

SCALE: AS SHOWN

E–002

SHEET 7 OF 19



PLAN AT EL 567.25

0 8' 16' 24'

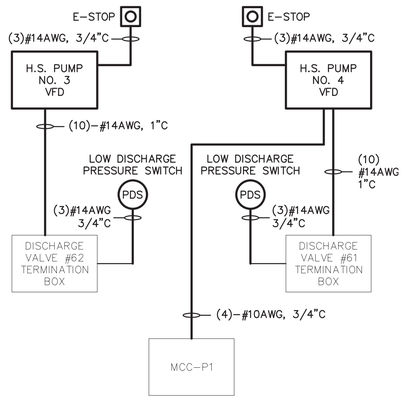
N

GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.

(X) SHEET KEYNOTES:

1. REWIRE LOW DISCHARGE PRESSURE SWITCH AND VALVE CONTROL TO NEW PUMP VFD.
2. CONTRACTOR SHALL INVESTIGATE EMBEDDED CONDUITS IN CONCRETE SLAB TO AVOID ANY CONFLICTS WITH CORE DRILLING FOR VFD CABINET PENETRATIONS.
3. ROUTE CONDUITS FOR VFD, MOTOR, AND CONTROL AT THIS LEVEL ALONG WITH EXISTING CONDUIT RACEWAY. NEW CONDUIT ROUTING SHALL NOT OBSTRUCT MAINTENANCE ACCESS TO EQUIPMENT. IF EXISTING CONDUIT TO RTU–13A (CONTROL ROOM) ARE FOUND IN GOOD CONDITION THEY CAN BE REUSED FOR NEW SCADA WIRING. INSTALL A STAINLESS STEEL OR ALUMINUM PULL BOX TO INTERFACE WITH NEW CONDUIT.
4. INSTALL NEW ASHCROFT DIFFERENTIAL PRESSURE SWITCHES WHERE THE MERCOID SWITCHES WERE LOCATED, USING SAME PROCESS CONNECTIONS.
5. MOUNT E–STOP PUSH–BUTTON STATIONS ON RIGID ALUMINUM CHANNEL STANDS. MOUNTING HEIGHT SHALL BE A MINIMUM OF 36" AFF AND A MAXIMUM OF 48" AFF.



WIRING RISER DIAGRAM

SCALE: NONE

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10/26/15

city of CINCINNATI

GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT H.S. PUMPS 3 & 4 VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA–300–05X0015
FILE NAME: BWTP–E–101
DESIGNED BY: R. SMITH
DRAWN BY: M. MATSON
CHECKED BY: J. STEED

SHEET TITLE

ELECTRICAL

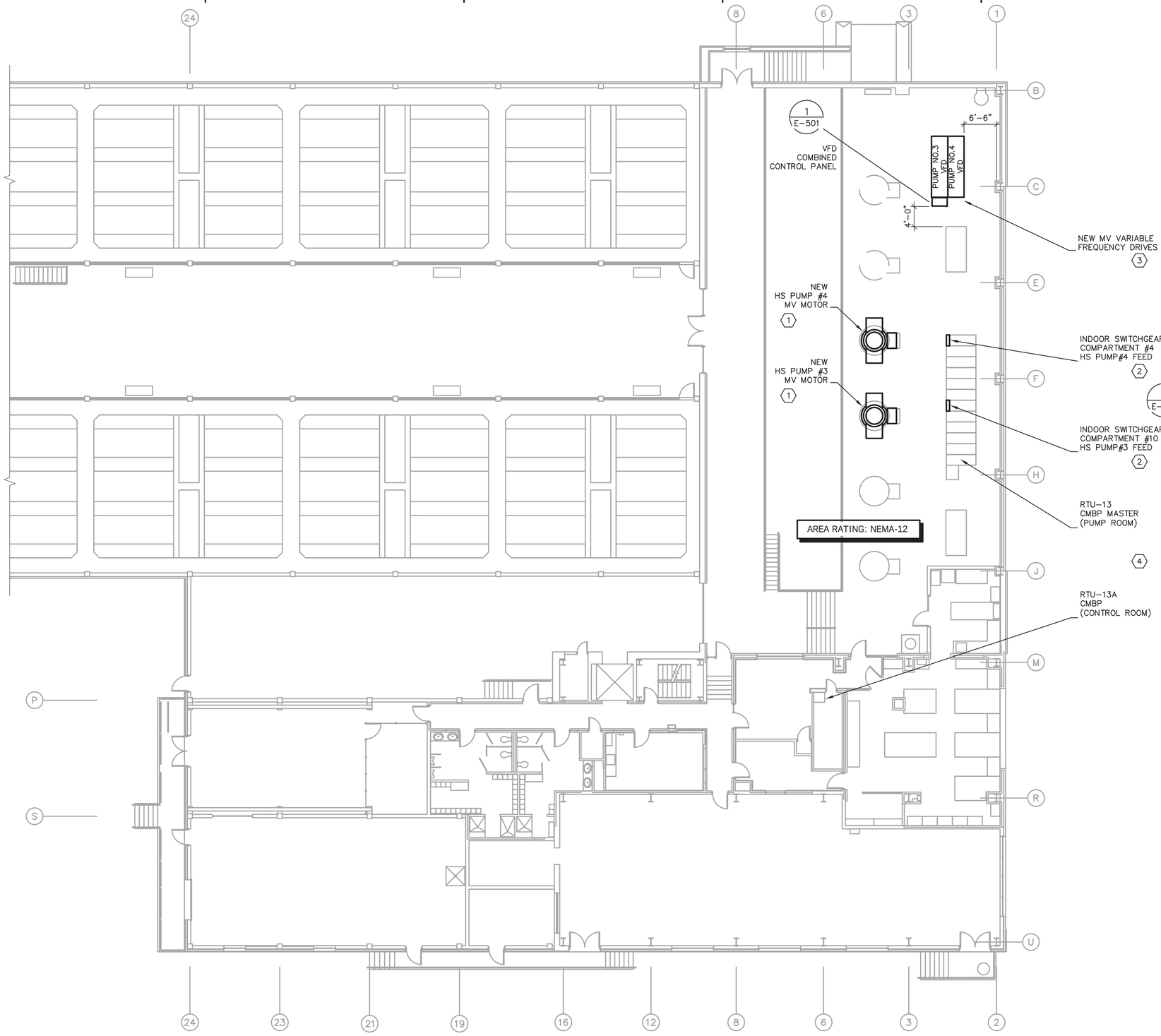
ELECTRICAL PLAN INTERMEDIATE FLOOR @ EL. 567.25

SCALE: AS SHOWN

E–101

SHEET 8 OF 19

User:####### Spec:AUS–NCSM0D File:D:\ASE\GCWW – CHARLES BOLTON HS PUMPS VFD\DRAWINGS\CADD DRAWINGS\BWTP–E–101.DWG Scale:1:1 SavedDate:9/21/2015 Time:22:06 Plot Date: Matt_PC; 10/26/2015; 11:29 ; Layout:E–101



PLAN AT EL 579.00

0 8' 16' 24'

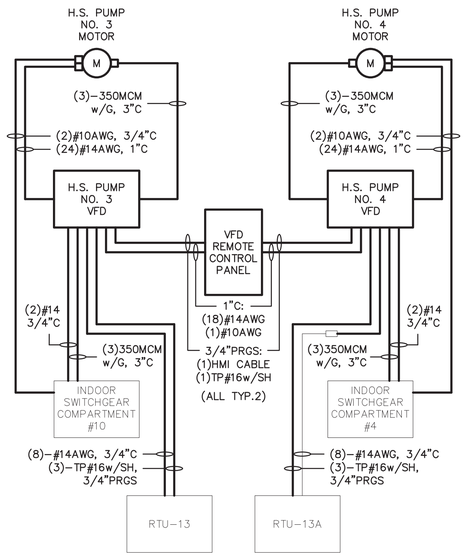
N

GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.

(X) SHEET KEYNOTES:

1. FURNISH AND INSTALL NEW MEDIUM VOLTAGE 1500HP MOTORS PER SPECIFICATION SECTION 26 14 01. CONTRACTOR SHALL FULLY INSTALL INCLUDING ALIGNMENT, TORQUING MOUNTING BOLTS, AND COUPLING PREP, INSTALLATION, AND LUBRICATION. CONDUIT FOR POWER AND CONTROL CABLES SHALL ROUTE UNDER OPERATING FLOOR. CONTRACTOR SHALL COORDINATE WITH MOTOR MANUFACTURER TO ALIGN CABLE CONNECTION BOX WITH EXISTING FLOOR PENETRATION SLEEVES.
2. REPLACE INDOOR SWITCHGEAR COMPARTMENT DOOR WITH NEW HINGED DOOR INCLUDING NEW FEEDER PROTECTION RELAY, BREAKER CONTROL SWITCH, BREAKER LOCKOUT SWITCH, AND PILOT LIGHTS. REWIRE BREAKER CONTROLS.
3. FURNISH AND INSTALL MEDIUM VOLTAGE VARIABLE FREQUENCY DRIVES. CABINETS AND VFD CONTROL PANEL SHALL BE INSTALLED ON 3.5" CONCRETE HOUSEKEEPING PADS. COORDINATE WITH CONCRETE WORK AND REBAR LAYOUT FOR CONDUIT SLEEVES REQUIRED. CABLE AND CONDUIT ENTRY SHALL BE FROM THE BOTTOM OF THE VFD ENCLOSURES. CORE DRILL FLOOR SLAB AS REQUIRED FOR NEW CONDUITS.
4. FINAL RTU TERMINATIONS SHALL BE BY CITY (GCWW).



WIRING RISER DIAGRAM

SCALE: NONE

ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

ASE
AUTOMATED SYSTEMS
ENGINEERING

SEALS

STATE OF OHIO
ROBERT JAMES SMITH
72643
REGISTERED
PROFESSIONAL ENGINEER
10/26/15

city of CINCINNATI
GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT
H.S. PUMPS 3 & 4
VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE:	OCTOBER 2015
PROJECT NO.:	MA-300-05X0015
FILE NAME:	BWTP-E-102
DESIGNED BY:	R. SMITH
DRAWN BY:	M. MATSON
CHECKED BY:	J. STEED

SHEET TITLE

ELECTRICAL

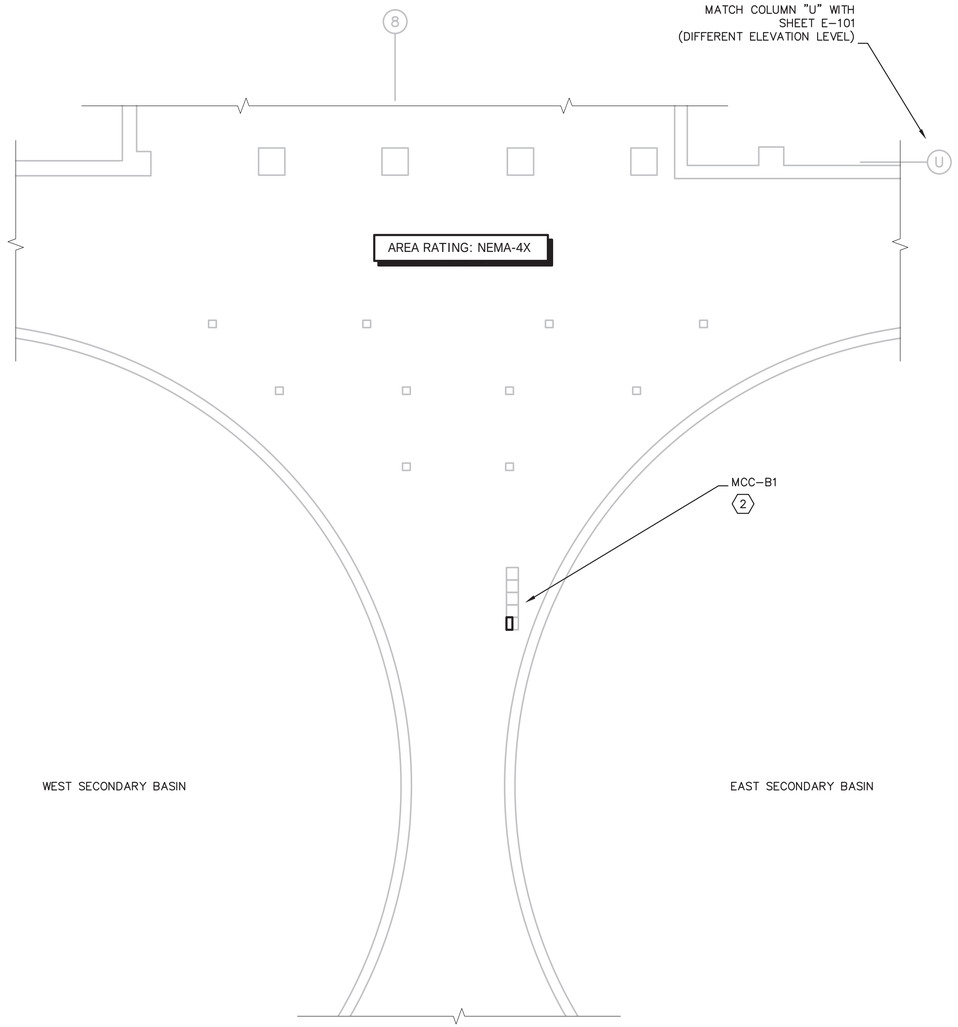
ELECTRICAL PLAN OPERATING FLOOR @ EL. 579.00

SCALE: AS SHOWN

E-102

SHEET 9 OF 19

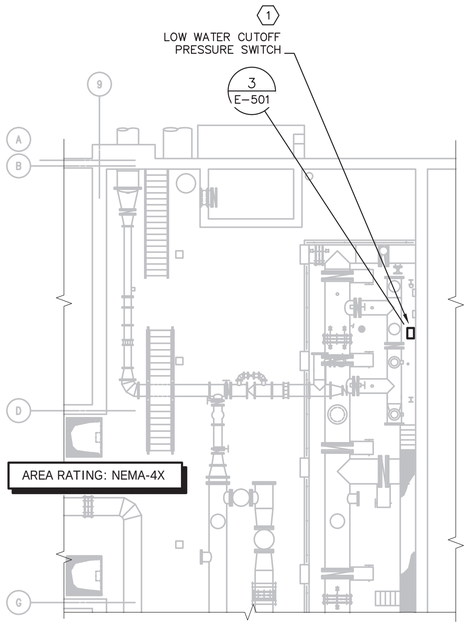
User:###### Spec:AUS-NCSMOD File:D:\ASE\GCWW - CHARLES BOLTON HS PUMPS VFD\DRAWINGS\CADD DRAWINGS\BWTP-E-102.DWG Scale:1:1 SavedDate:9/21/2015 Time:22:12 Plot Date: Matt_PC; 10/26/2015; 11:29 ; Layout:E-102



SETTLING BASINS
PLAN AT EL 554.50

0 8' 16' 24'

N



PUMP ROOM – BASEMENT
PLAN AT EL 554.50

0 8' 16' 24'

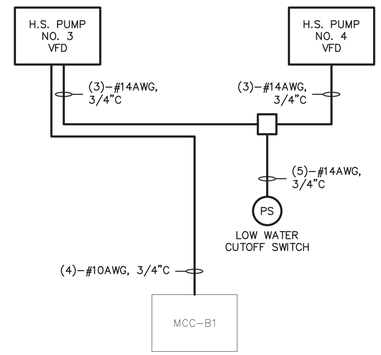
N

GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.

(X) SHEET KEYNOTES:

1. REPLACE THE EXISTING MERCOID PRESSURE SWITCH WITH AN ASHCROFT PRESSURE SWITCH USING THE SAME PROCESS CONNECTION. DO NOT DAMAGE MERCOID SWITCH DURING REMOVAL – MERCOID SWITCHES CONTAIN MERCURY. CONTRACTOR SHALL DISPOSE OF SWITCHES IN ACCORDANCE WITH EPA RCRA REQUIREMENTS AND PROVIDE SHIPMENT AND DISPOSAL DOCUMENTATION TO THE CITY.
2. FURNISH AND INSTALL NEW BREAKER FOR MCC–B1 TO FEED 480V AUXILIARY POWER TO HIGH SERVICE PUMP NO. 3 VFD CABINET.



WIRING RISER DIAGRAM
SCALE: NONE

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
CONSULTANTS
AUTOMATED SYSTEMS
ENGINEERING

SEALS

STATE OF OHIO
ROBERT JAMES SMITH
72643
REGISTERED
PROFESSIONAL ENGINEER

10/26/15

city of CINCINNATI
GREATER CINCINNATI WATER WORKS

**GCWW BOLTON WATER TREATMENT PLANT
H.S. PUMPS 3 & 4
VFD/MOTOR IMPLEMENTATION**

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA–300–05X0015
FILE NAME: BWTP–E–103
DESIGNED BY: R. SMITH
DRAWN BY: M. MATSON
CHECKED BY: J. STEED

SHEET TITLE

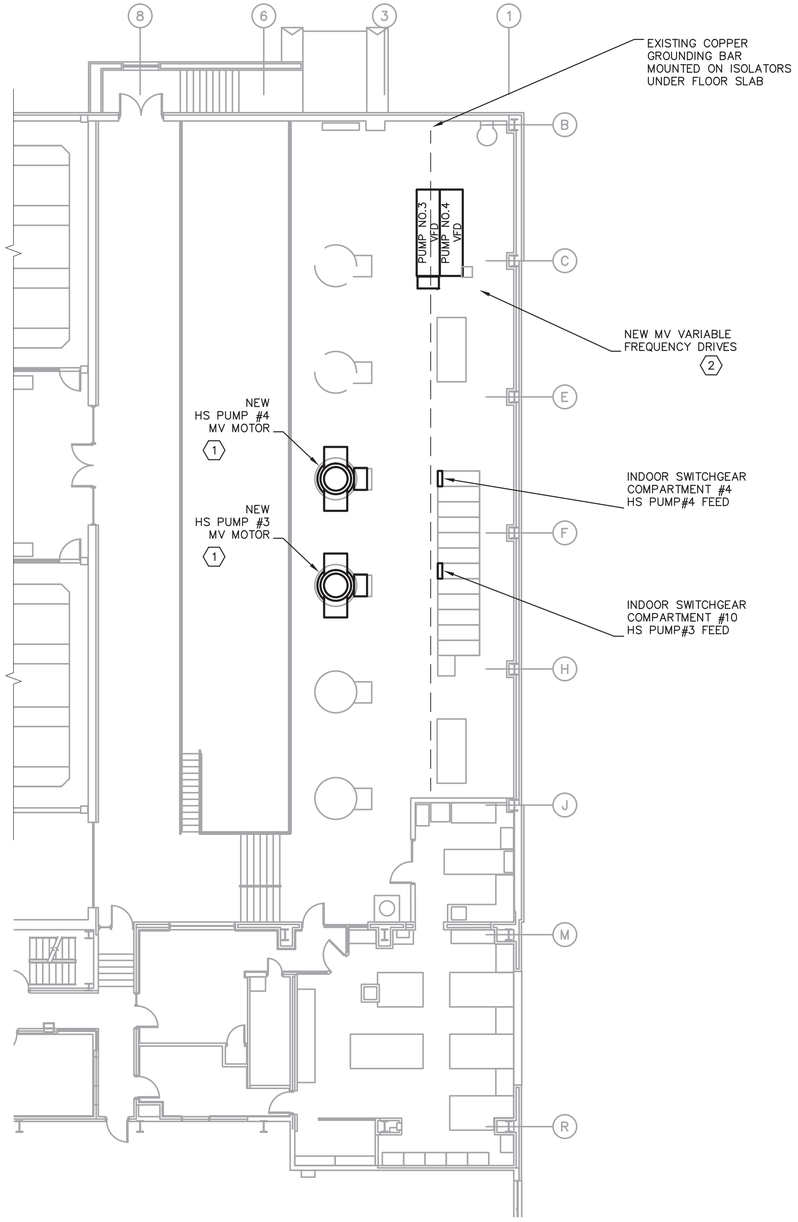
ELECTRICAL

**ELECTRICAL PLAN
OPERATING FLOOR
@ EL. 554.50**

SCALE: AS SHOWN

E–103

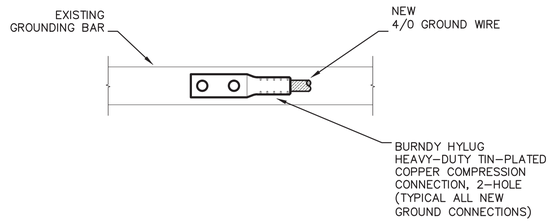
SHEET 10 OF 19



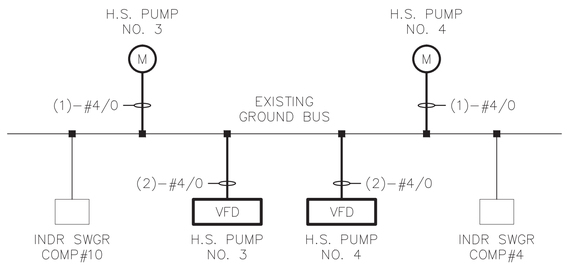
PLAN AT EL 579.00

0 8' 16' 24'

N



GROUNDING CONNECTION DETAIL



GROUNDING CONNECTION SCHEMATIC

GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.
2. INSTALL AND TEST GROUNDING SYSTEM PER SPECIFICATION SECTION 26 05 26.

⟨X⟩ SHEET KEYNOTES:

1. FURNISH AND INSTALL NEW #4/0 AWG STRANDED COPPER EQUIPMENT GROUNDING CONDUCTOR FROM PUMP MOTOR FRAME GROUNDING CONNECTION TO EXISTING BUILDING COPPER GROUNDING BAR. USE BOLT-ON COMPRESSION CONNECTIONS FOR EACH END.
2. FURNISH AND INSTALL NEW #4/0 AWG STRANDED COPPER EQUIPMENT GROUNDING CONDUCTOR FROM VFD CABINET GROUND BUS TO EXISTING BUILDING COPPER GROUNDING BAR. USE BOLT-ON COMPRESSION CONNECTIONS FOR EACH END.

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STATE OF OHIO
ROBERT JAMES SMITH
72643
REGISTERED
PROFESSIONAL ENGINEER
10/26/15

city of CINCINNATI
GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT H.S. PUMPS 3 & 4 VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA-300-05X0015
FILE NAME: BWTP-E-104
DESIGNED BY: R. SMITH
DRAWN BY: M. MATSON
CHECKED BY: J. STEED

SHEET TITLE

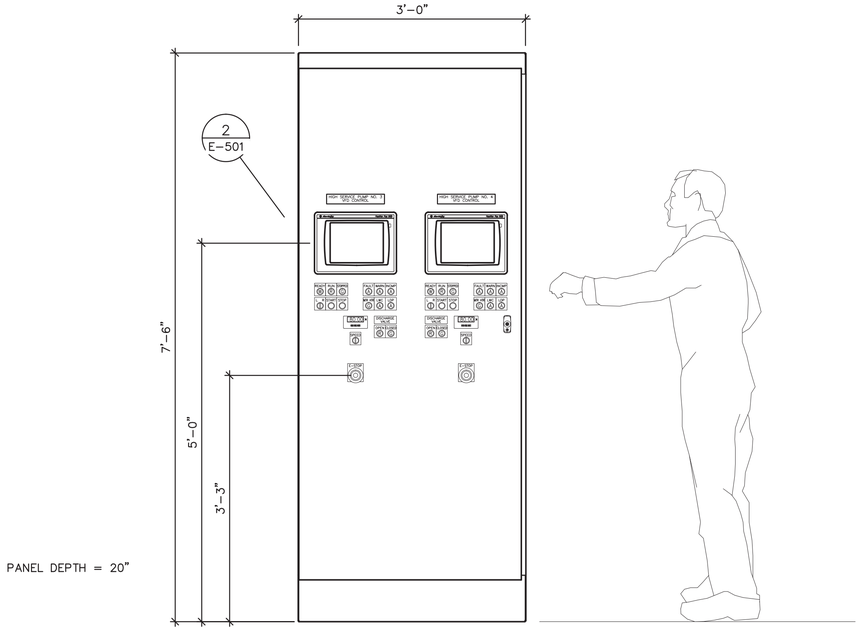
ELECTRICAL

GROUNDING AND BONDING PLAN

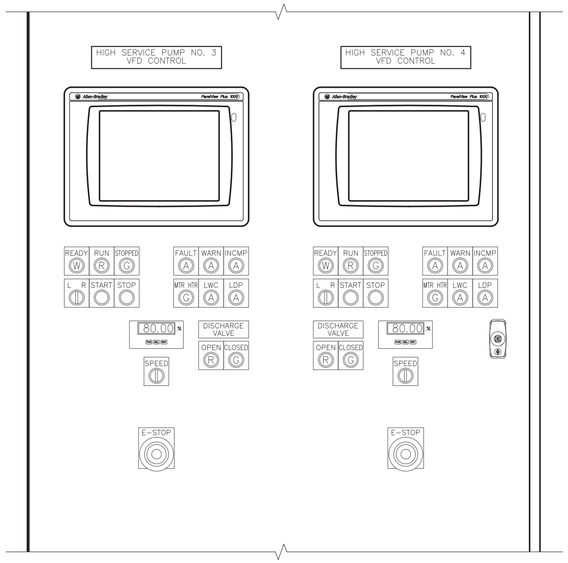
SCALE: AS SHOWN

E-104

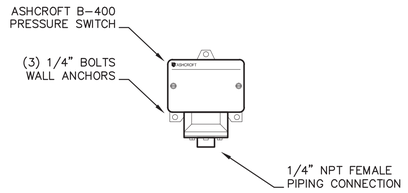
SHEET 11 OF 19



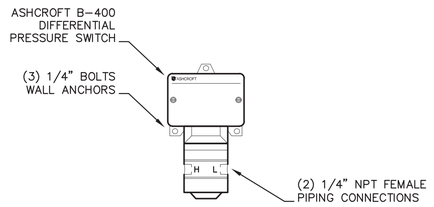
1 HS PUMP VFD COMBINED CONTROL PANEL
Scale: NTS



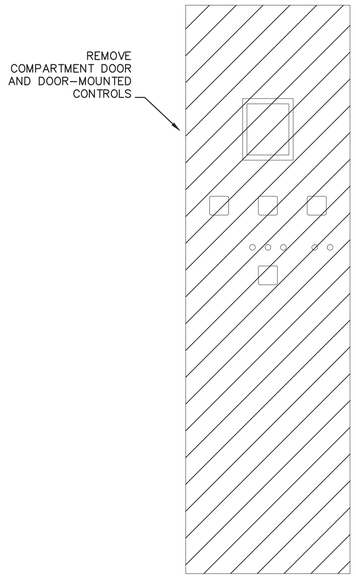
2 VFD CONTROL PANEL LAYOUT
Scale: NTS



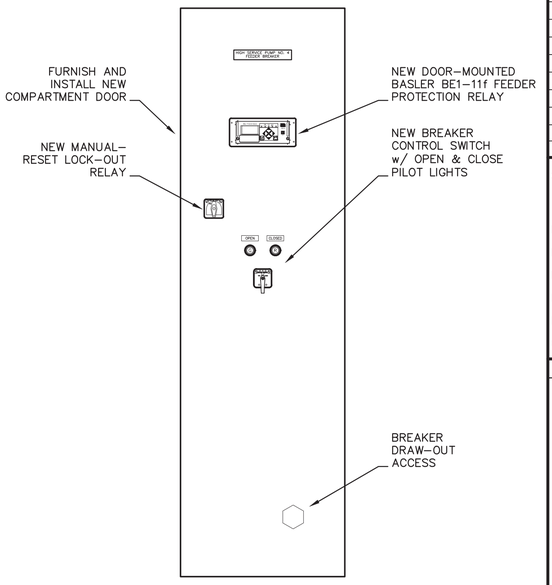
3 PRESSURE SWITCH DETAIL
Scale: NTS



4 DIFFERENTIAL PRESSURE SWITCH DETAIL
Scale: NTS



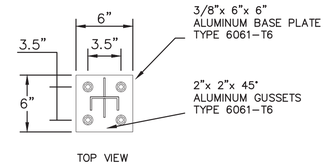
5 INDOOR SWITCHGEAR COMPARTMENTS 4, 10 DOOR DEMOLITION
Scale: NTS



6 INDOOR SWITCHGEAR COMPARTMENTS 4, 10 DOOR MODIFICATIONS
Scale: NTS

GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.
2. ANCHOR DEVICES AND PANELS USING STAINLESS ANCHOR BOLTS. ANCHORS SHALL BE EITHER DRILLED AND SET WITH HILTI EPOXY GROUT OR EQUAL, OR SHALL BE EXPANSION ANCHORS.



7 MOUNTING STAND BASE DETAIL
Scale: NTS

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SEALS

STATE OF OHIO
ROBERT JAMES SMITH
72643
REGISTERED
PROFESSIONAL ENGINEER
10/26/15

city of CINCINNATI
GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT
H.S. PUMPS 3 & 4
VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE:	OCTOBER 2015
PROJECT NO.:	MA-300-05X0015
FILE NAME:	BWTP-E-501
DESIGNED BY:	R. SMITH
DRAWN BY:	M. MATSON
CHECKED BY:	J. STEED

SHEET TITLE

ELECTRICAL

INSTALLATION DETAILS

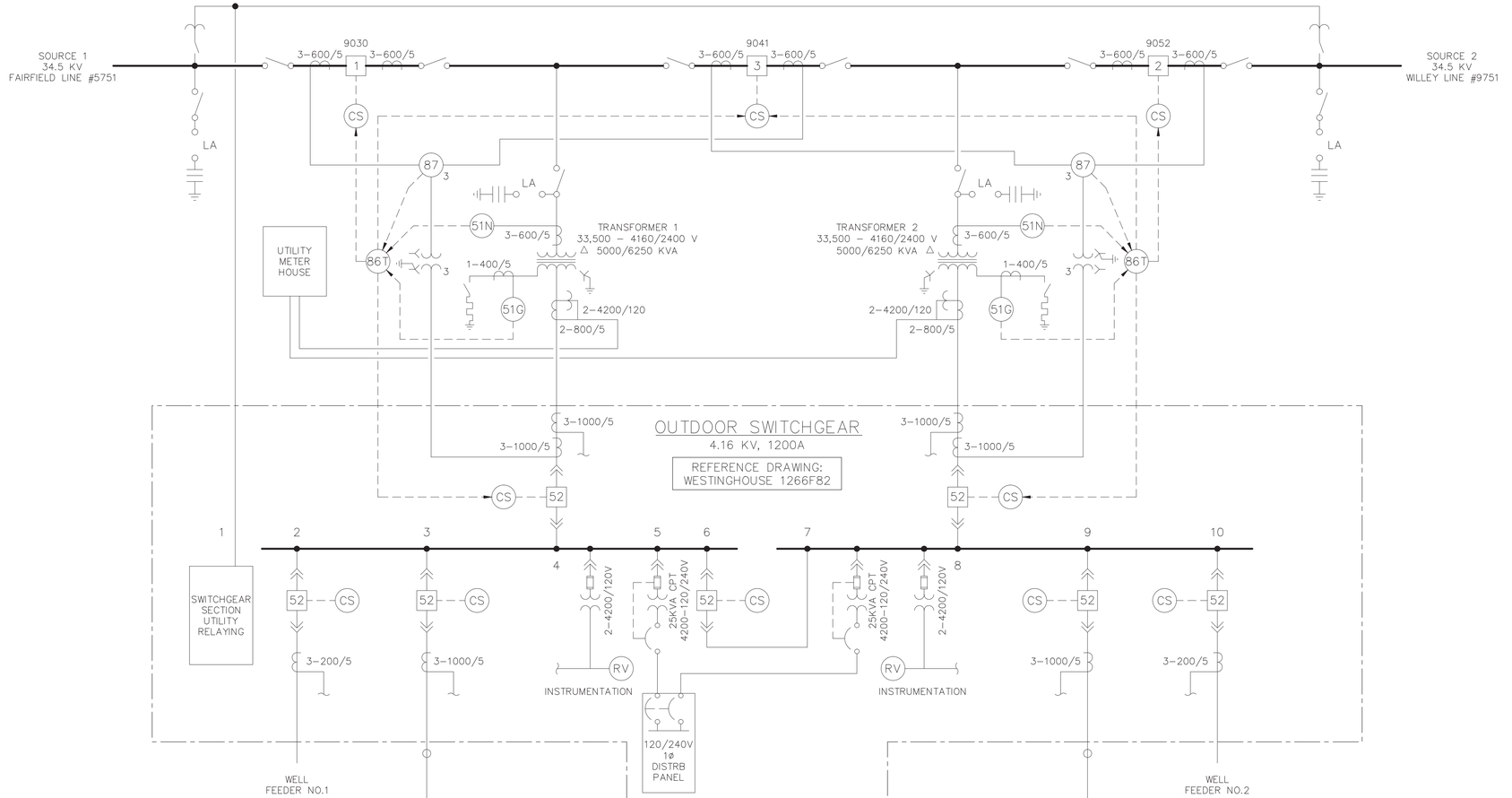
SCALE: AS SHOWN

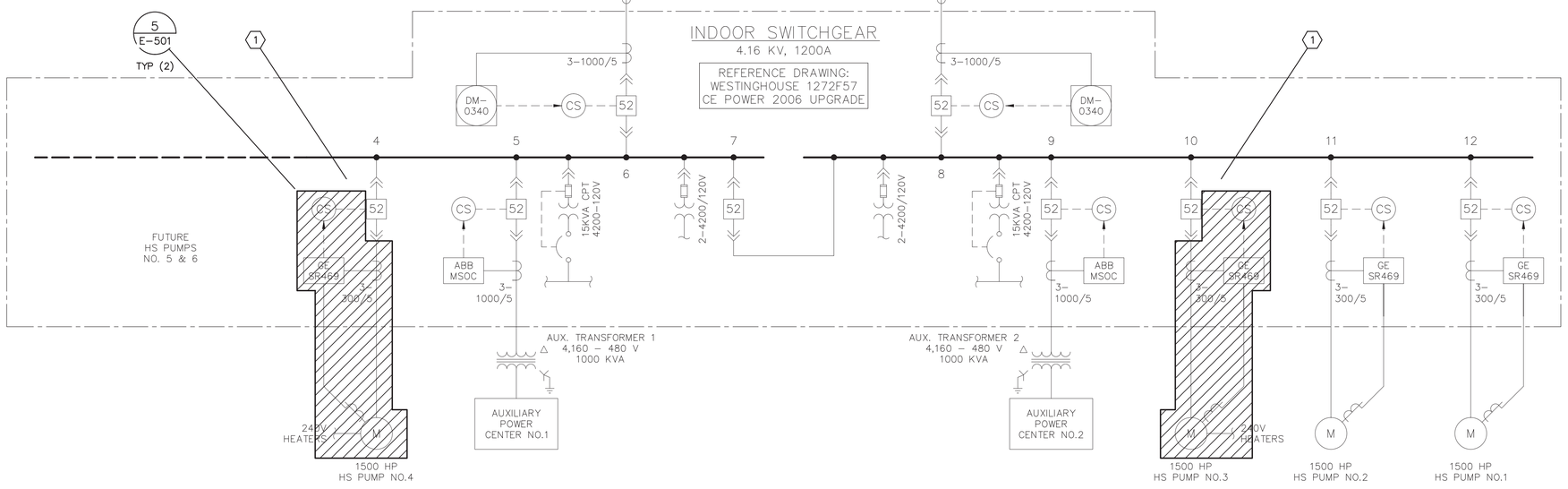
E-501

SHEET 12 OF 19

User:###### Spec:AUS-NCSMOD File:D:\ASE\GCWW - CHARLES BOLTON HS PUMPS VFD\DRAWINGS\CADD DRAWINGS\BWTP-E-501.DWG Scale:1:1 SavedDate:9/21/2015 Time:22:25 Plot Date: Matt_PC; 10/26/2015; 11:30 ; Layout:E-501

34.5 KV SUBSTATION





GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.
2. ONE–LINE DRAWING IS BASED ON 1973 BLACK & VEATCH DRAWING A–4721 AND 2006 C.E. POWER PROJ. NO. 800157. CONTRACTOR SHALL FIELD VERIFY PHYSICAL INSTALLATION AS REQUIRED.

ⓧ SHEET KEYNOTES:

1. INDOOR SWITCHGEAR COMPARTMENTS 4 & 10 SHALL BE MODIFIED FROM PUMP CONTROL TO VFD FEEDER BREAKERS. EXISTING CONTROLS SHALL BE REMOVED AND THE COMPARTMENT DOOR SHALL BE REPLACED.

LEGEND:

AM	AMMETER
AS	AMMETER SWITCH
CPT	CONTROL POWER TRANSFORMER
CS	CONTROL SWITCH
ET	ELAPSED TIME METER
LA	LIGHTNING ARRESTER
MSOC	MULTIPHASE TIME–OVERCURRENT RELAY
PF	POWER FACTOR METER
PT	POTENTIAL TRANSFORMER
RTD	RESISTANCE TEMPERATURE DETECTOR
RV	RECORDING VOLTMETER
TM	TEMPERATURE METER
TS	TEMPERATURE SWITCH
VFD	VARIABLE FREQUENCY DRIVE
VM	VOLTMETER
VS	VOLTMETER SWITCH
WH	WATT–HOUR METER
WM	WATTMETER
27	UNDERVOLTAGE RELAY
51&51N	TIME OVERCURRENT RELAY
51G	GROUND OVERCURRENT RELAY
52	A/C CIRCUIT BREAKER
86S	LOCKOUT RELAY – SWITCHGEAR
86T	LOCKOUT RELAY – TRANSFORMER
87	DIFFERENTIAL RELAY

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LEGAL ENTITY:
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CONSULTANTS

AUTOMATED SYSTEMS ENGINEERING

SEALS

STATE OF OHIO
ROBERT JAMES SMITH
72643
REGISTERED
PROFESSIONAL ENGINEER

10/26/15

city of CINCINNATI
GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT H.S. PUMPS 3 & 4 VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE:	OCTOBER 2015
PROJECT NO.:	MA–300–05X0015
FILE NAME:	BWTP–E–601
DESIGNED BY:	R. SMITH
DRAWN BY:	M. MATSON
CHECKED BY:	J. STEED

SHEET TITLE

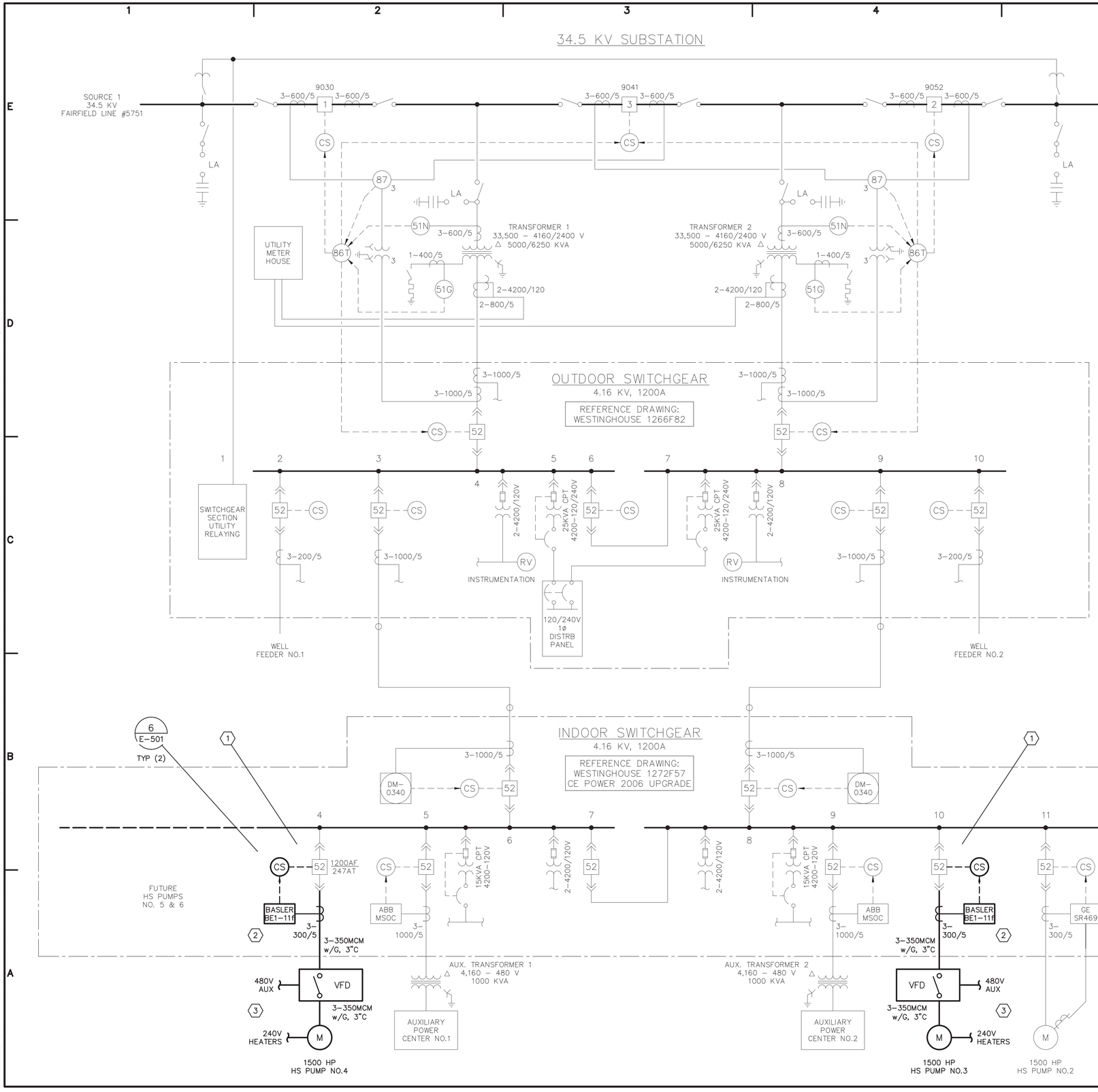
ELECTRICAL

PLANT ONE–LINE DIAGRAM DEMOLITION

SCALE: AS SHOWN

E–601

SHEET 13 OF 19



GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.
2. ONE–LINE DRAWING IS BASED ON 1973 BLACK & VEATCH DRAWING A–4721 AND 2006 C.E. POWER PROJ. NO. 800157. CONTRACTOR SHALL FIELD VERIFY PHYSICAL INSTALLATION AS REQUIRED.

ⓧ SHEET KEYNOTES:

1. INDOOR SWITCHGEAR COMPARTMENTS 4 & 10 SHALL BE MODIFIED FROM PUMP CONTROL TO VFD FEEDER BREAKERS. EXISTING CONTROLS SHALL BE REMOVED, A NEW FEEDER PROTECTION RELAY AND NEW CTs SHALL BE INSTALLED, AND THE COMPARTMENT DOOR SHALL BE REPLACED WITH A NEW HINGED DOOR AND CONTROLS.
2. FURNISH FEEDER PROTECTIVE RELAYS (BASLER BE1–11f MODEL). FURNISH RELAY WITH H1 RACK MOUNT CASE FOR PANEL MOUNTING.
3. SOURCES OF POWER:
   480V – FROM MCCs – SEE SHEETS E–606/E–607
   240V – FROM SWGR – SEE SHEET E–604

CONSTRUCTION SEQUENCE NOTES:

1. COMPLETE H.S. PUMP NO. 4 CONVERSION FIRST. H.S. PUMP NO. 4 MUST BE UP AND RUNNING WITH NO ISSUES BEFORE H.S. PUMP NO. 3 CAN BE TAKEN OUT OF SERVICE FOR VFD/MOTOR CONVERSION.
2. INSTALL MOTOR AND VFD FOR H.S. PUMP NO. 3 AND COMPLETE WIRING BETWEEN THE TWO BEFORE TAKING INDOOR SWITCHGEAR BUS DOWN FOR SWTCHGEAR CABINET MODIFICATIONS AND FINAL CABLE CONNECTIONS BETWEEN SWITCHGEAR AND VFD. MINIMIZE DOWNTIME OF INDOOR SWITCHGEAR BUS WHICH FEEDS THREE OF THE FOUR PUMPS.

INDOOR SWITCHGEAR - LOAD TABLE

COMPT #	FEEDER NAME	HP	KVA	AMPS	VOLTS	DEMAND FACTOR	DEMAND KVA
4	**H.S. PUMP NO. 4**	**1500**		**196**	**4160**	**1**	**1381.5**
5	AUXILIARY POWER CENTER 1 XFMR		1000	139	4160	0.8	800.0
9	AUXILIARY POWER CENTER 2 XFMR		1000	139	4160	0.8	800.0
10	**H.S. PUMP NO. 3**	**1500**		**196**	**4160**	**1**	**1381.5**
12	H.S. PUMP NO. 2	1500		167.2	4160	1	1381.5
14	H.S. PUMP NO. 1	1500		167.2	4160	1	1381.5

TOTAL CONNECTED KVA	7525.9
TOTAL DEMAND KVA	7126.0
TOTAL DEMAND AMPS	989
MAIN BREAKER AMPS	1200

LEGEND:

AM	AMMETER
AS	AMMETER SWITCH
CPT	CONTROL POWER TRANSFORMER
CS	CONTROL SWITCH
ET	ELAPSED TIME METER
LA	LIGHTNING ARRESTER
MSOC	MULTIPHASE TIME–OVERCURRENT RELAY
PF	POWER FACTOR METER
PT	POTENTIAL TRANSFORMER
RTD	RESISTANCE TEMPERATURE DETECTOR
RV	RECORDING VOLTMETER
TM	TEMPERATURE METER
TS	TEMPERATURE SWITCH
VFD	VARIABLE FREQUENCY DRIVE
VM	VOLTMETER
VS	VOLTMETER SWITCH
WH	WATT–HOUR METER
WM	WATTMETER
27	UNDERVOLTAGE RELAY
51&51N	TIME OVERCURRENT RELAY
51G	GROUND OVERCURRENT RELAY
52	A/C CIRCUIT BREAKER
86S	LOCKOUT RELAY – SWITCHGEAR
86T	LOCKOUT RELAY – TRANSFORMER
87	DIFFERENTIAL RELAY

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LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

AUTOMATED SYSTEMS ENGINEERING

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ROBERT JAMES SMITH
72643
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PROFESSIONAL ENGINEER

10/26/15

city of CINCINNATI
GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT H.S. PUMPS 3 & 4 VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA–300–05X0015
FILE NAME: BWTP–E–602
DESIGNED BY: R. SMITH
DRAWN BY: M. MATSON
CHECKED BY: J. STEED

SHEET TITLE

ELECTRICAL

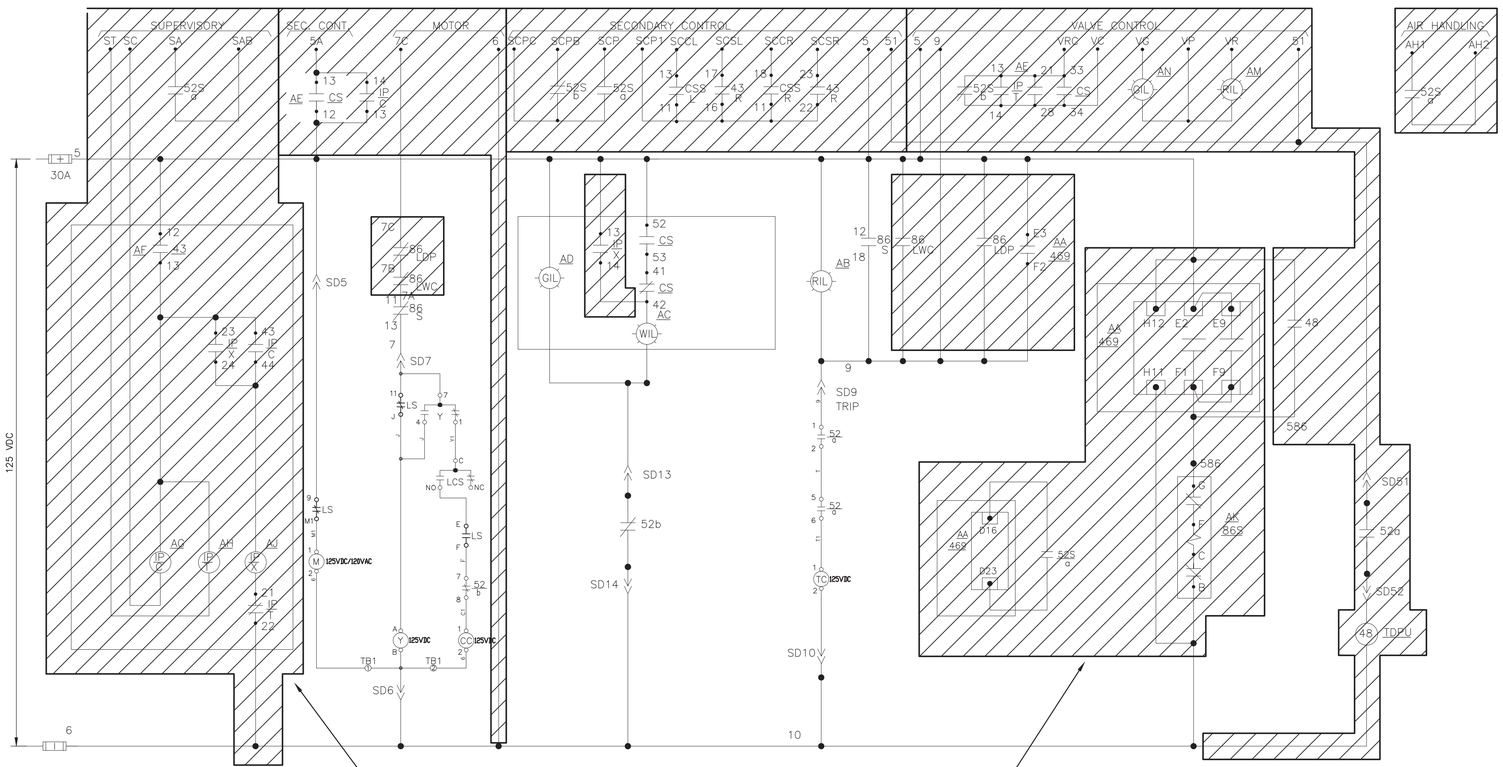
PLANT ONE–LINE DIAGRAM PROPOSED

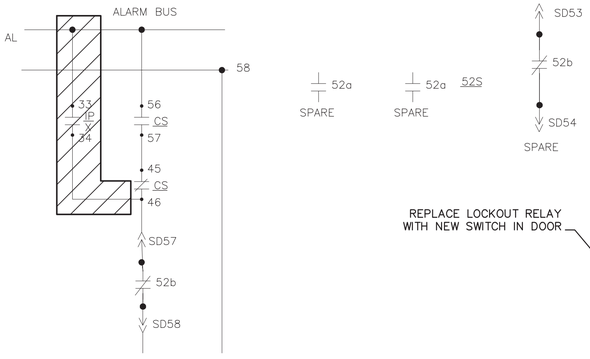
SCALE: AS SHOWN

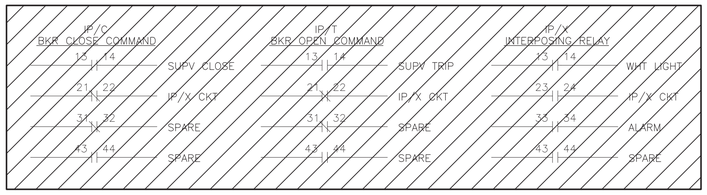
E–602

SHEET 14 OF 19

User:####### Spec:AUS–NCSMOD File:D:\ASE\GCWW – CHARLES BOLTON HS PUMPS VFD\DRAWINGS\CADD DRAWINGS\BWTP–E–602.DWG Scale:1:1 SavedDate:9/21/2015 Time:22:26 Plot Date: Matt_PC, 10/26/2015; 11:30 ; Layout:E–602

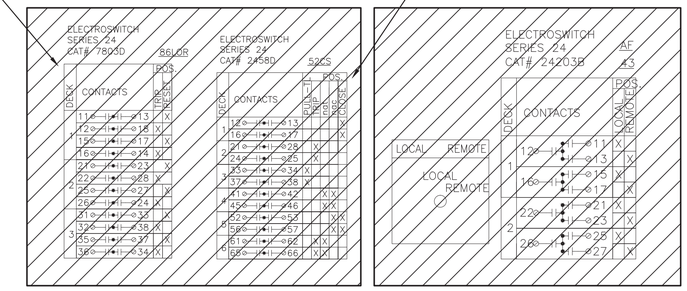






REPLACE LOCKOUT RELAY WITH NEW SWITCH IN DOOR

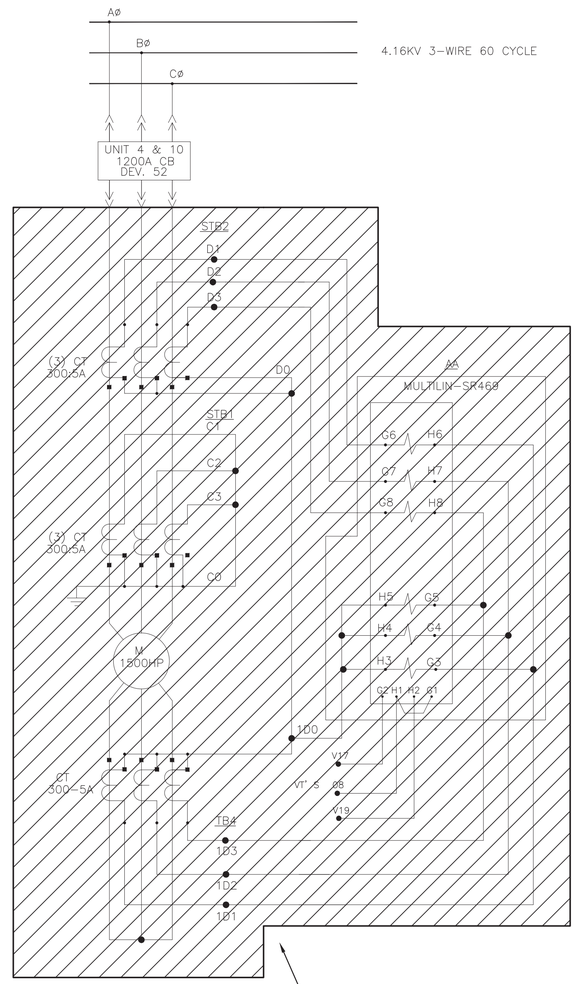
REPLACE BREAKER CONTROL SWITCH WITH NEW, IN DOOR



CIRCUIT DIAGRAM REFERENCED FROM:
C.E. POWER SOLUTIONS LLC
PROJECT NO. 800157, DWG. NO. A-7828-2

GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.



AC SCHEMATIC

DEMO MOTOR FEEDER CABLES AND CTs. CABLES WILL BE REPLACED WITH NEW TO VFD. CTs AND VTs WILL BE REPLACED WITH NEW FOR FEEDER PROTECTION RELAY. SALVAGE EXISTING CTs AND RETURN TO CITY.

CIRCUIT DIAGRAM REFERENCED FROM:
C.E. POWER SOLUTIONS LLC
PROJECT NO. 800157, DWG. NO. A-7828-1

ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.

CONSULTANTS

AUTOMATED SYSTEMS ENGINEERING

SEALS

STATE OF OHIO
ROBERT JAMES SMITH II
72643
REGISTERED
PROFESSIONAL ENGINEER
10/26/15

city of CINCINNATI
GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT H.S. PUMPS 3 & 4 VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE:	OCTOBER 2015
PROJECT NO.:	MA-300-05X0015
FILE NAME:	BWTP-E-603
DESIGNED BY:	R. SMITH
DRAWN BY:	M. MATSON
CHECKED BY:	J. STEED

SHEET TITLE

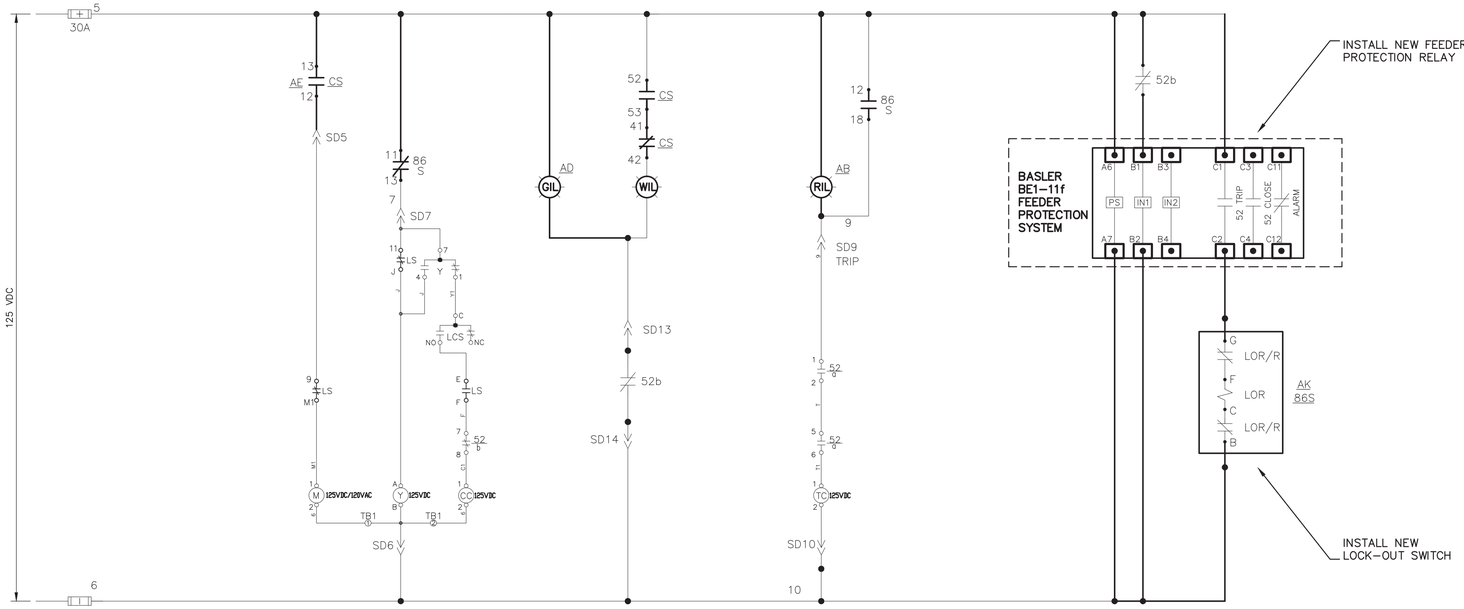
ELECTRICAL

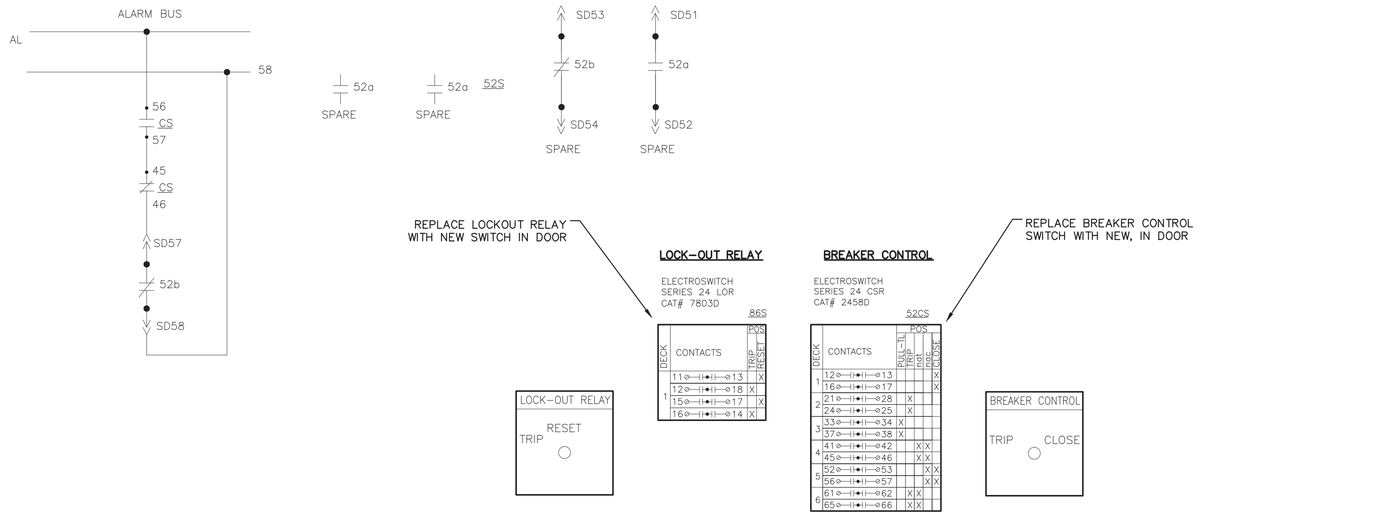
EXISTING INDOOR SWITCHGEAR COMPARTMENTS 4 & 10 DEMOLITION

SCALE: AS SHOWN

E-603

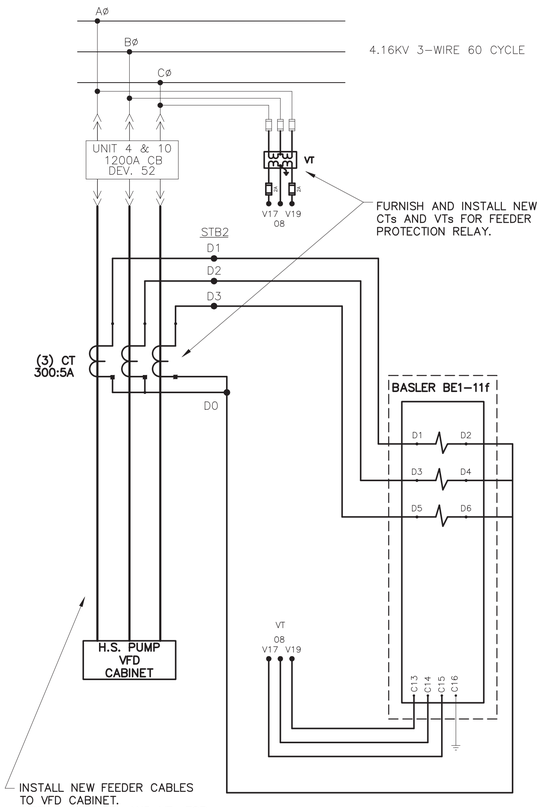
SHEET 15 OF 19



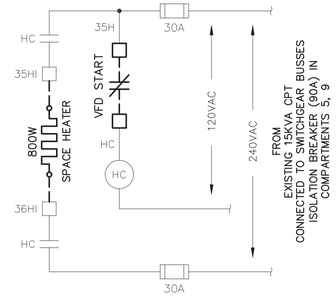


GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.
2. CONTRACTOR SHALL DEVELOP CONSTRUCTION WIRING DIAGRAM FOR MODIFIED BREAKER CONTROLS AND SUBMIT FOR APPROVAL PRIOR TO TAKING COMPARTMENT OUT OF SERVICE FOR WORK. WIRING DIAGRAMS SHALL INCLUDE CONTROL CIRCUITS, WIRING, AND TERMINALS.



AC SCHEMATIC



MOTOR HEATER CIRCUIT

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STATE OF OHIO
ROBERT JAMES SMITH
72643
REGISTERED
PROFESSIONAL ENGINEER
10/26/15

city of CINCINNATI
GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT H.S. PUMPS 3 & 4 VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE:	OCTOBER 2015
PROJECT NO.:	MA–300–05X0015
FILE NAME:	BWTP–E–604
DESIGNED BY:	R. SMITH
DRAWN BY:	M. MATSON
CHECKED BY:	J. STEED

SHEET TITLE

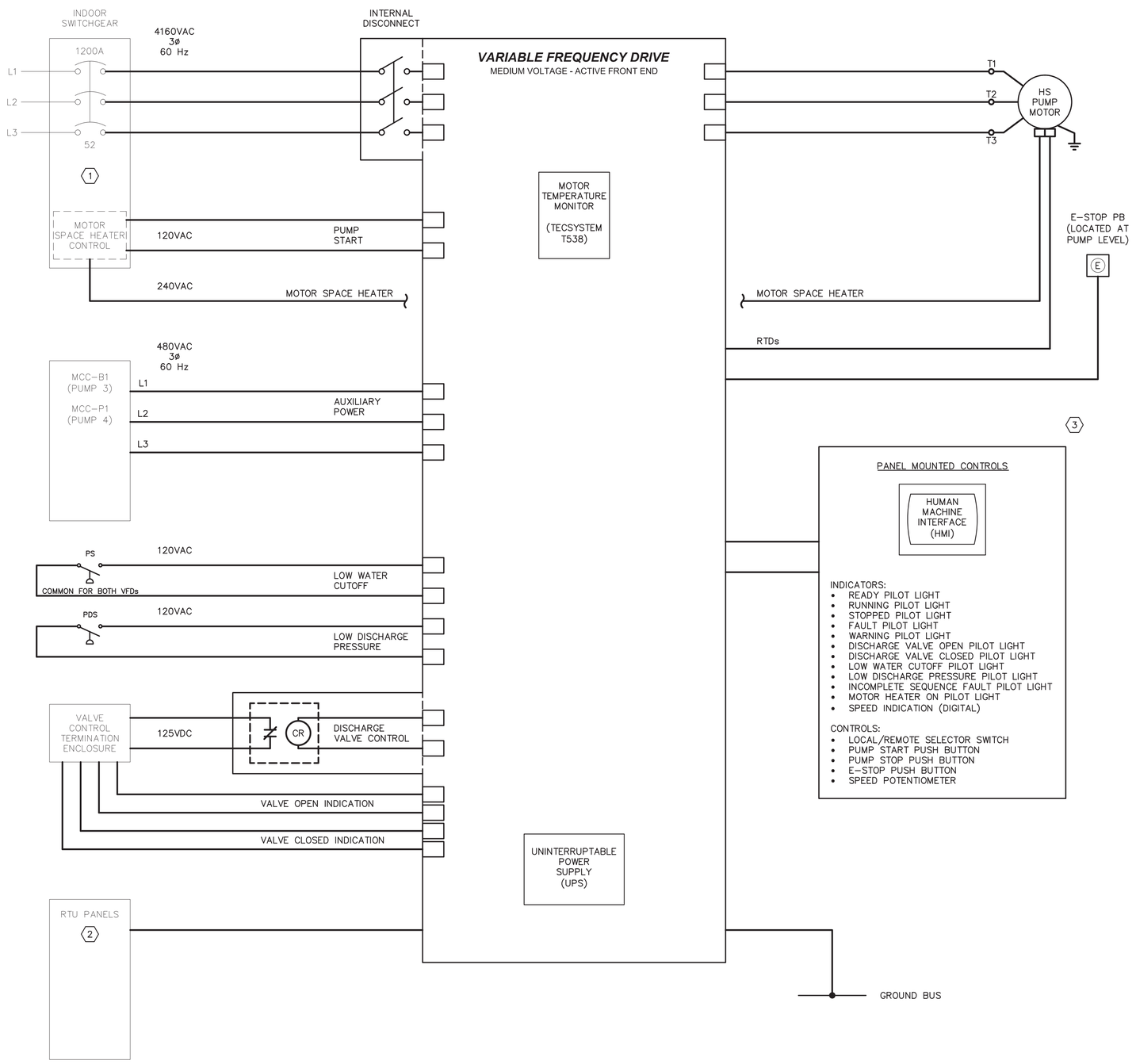
ELECTRICAL

EXISTING INDOOR SWITCHGEAR COMPARTMENTS 4 & 10 MODIFICATIONS

SCALE: AS SHOWN

E–604

SHEET 16 OF 19



GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.
2. DETAILED WIRING DIAGRAMS FOR ENTIRE SYSTEM, FROM POWER SOURCES TO MOTOR, SHALL BE DEVELOPED BY VFD MANUFACTURER AND PROVIDED FOR APPROVAL.
3. CONTRACTOR SHALL FIELD VERIFY WIRING TERMINATIONS TO EXISTING EQUIPMENT.

(X) SHEET KEYNOTES:

1. SWITCHGEAR DESIGNATION:
   HS PUMP 3 – COMP.4 (POWER), COMP.5 (HEATERS)
   HS PUMP 4 – COMP.10 (POWER), COMP.9 (HEATERS)
2. RTU PANEL DESIGNATION:
   HS PUMP 3 – RTU–13 (PUMP ROOM)
   HS PUMP 4 – RTU–13A (CONTROL ROOM)
   REFER TO TERMINATION TABLE FOR CONNECTIONS.
3. REFER TO SHEET E–501 FOR VFD COMBINED CONTROL PANEL LAYOUT, FURNISHED BY VFD MANUFACTURER.

NORMAL OPERATING SEQUENCE:

1. INITIATE PUMP RUN COMMAND (LOCAL OR SCADA) WITH A MOMENTARY CONTACT.
2. PUMP WILL RAMP UP TO A MINIMUM SPEED SETPOINT.
3. ONCE MINIMUM SPEED IS REACHED, VFD SENDS CONTACT OUTPUT TO OPEN DISCHARGE VALVE.
4. ONCE DISCHARGE VALVE FULLY OPEN CONFIRMATION HAS BEEN RECEIVED, AND WATER CUTOFF/PRESSURE INPUTS ARE MET, VFD CAN RAMP UP TO SPEED COMMAND SETPOINT (LOCAL OR SCADA).
5. IF DISCHARGE VALVE FULLY OPEN CONFIRMATION HAS NOT BEEN RECEIVED IN 3 MINUTES, 30 SECONDS (INCOMPLETE SEQUENCE FAULT) THE VFD WILL STOP ON FAIL TO COMMAND.
6. ON A VFD FAULT, MOTOR OUTPUT WILL BE SET TO A RAMP STOP.
7. FOR NORMAL PUMP SHUTDOWN, THE OPERATOR WILL PERFORM THE FOLLOWING SEQUENCE TO INITIATE A PUMP STOP:
   > RAMP DOWN PUMP SPEED TO MINIMUM SPEED SETPOINT.
   > VFD ISSUES A VALVE CLOSE COMMAND.
   > ONCE THE DISCHARGE VALVE REACHED 95% CLOSED, A LIMIT SWITCH WILL INDICATE VALVE CLOSED CONFIRMATION.
   > UPON VALVE CONFIRMAITON VFD WILL RAMP TO A STOP.

INTERLOCKS:

1. LOW DISCHARGE PRESSURE
2. LOW WATER CUTOFF
3. INCOMPLETE SEQUENCE
4. RTD MOTOR TEMPERATURE FAULT

HS PUMPS – RTU TERMINATIONS

I/O TYPE	PUMP	DESCRIP	RTU	SLOT	TB	TERM
DI	3	PUMP RUNNING	13	1	TB	9–6
DI	3	PUMP STOPPED (OFF)	13	3	TB	4–15, 4–16
DI	3	LOCAL / REMOTE STATUS	13	1	TB	P–9, P–10
DI	3	VFD FAULT	13			
DO	3	PUMP START COMMAND	13	4	TBA	5
DO	3	PUMP STOP COMMAND	13	4	TBA	6
AO	3	PUMP SPEED SETPOINT (RPM)	13			
AI	3	PUMP SPEED FEEDBACK (RPM)	13	7	TB–M	16,17,18,19
AI	3	PUMP POWER FEEDBACK (KW)	13			
DI	4	PUMP RUNNING	13A			
DI	4	PUMP STOPPED (OFF)	13A	2	TB	4–17, 4–18
DI	4	LOCAL / REMOTE STATUS	13A			
DI	4	VFD FAULT	13A			
DO	4	PUMP START COMMAND	13A	6	TBA	7
DO	4	PUMP STOP COMMAND	13A	6	TBA	8
AO	4	PUMP SPEED SETPOINT (RPM)	13A			
AI	4	PUMP SPEED FEEDBACK (RPM)	13A	5	TB–M	16,17,18,19
AI	4	PUMP POWER FEEDBACK (KW)	13A			

* SLOT, TB, TERM SHOWN FOR EXISTING SIGNALS ONLY.
FINAL RTU ASSIGNMENTS AND TERMINATIONS SHALL BE COMPLETED BY CITY (GCWW).

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10/26/15

city of CINCINNATI
GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT H.S. PUMPS 3 & 4 VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA–300–05X0015
FILE NAME: BWTP–E–605
DESIGNED BY: R. SMITH
DRAWN BY: M. MATSON
CHECKED BY: J. STEED

SHEET TITLE

ELECTRICAL

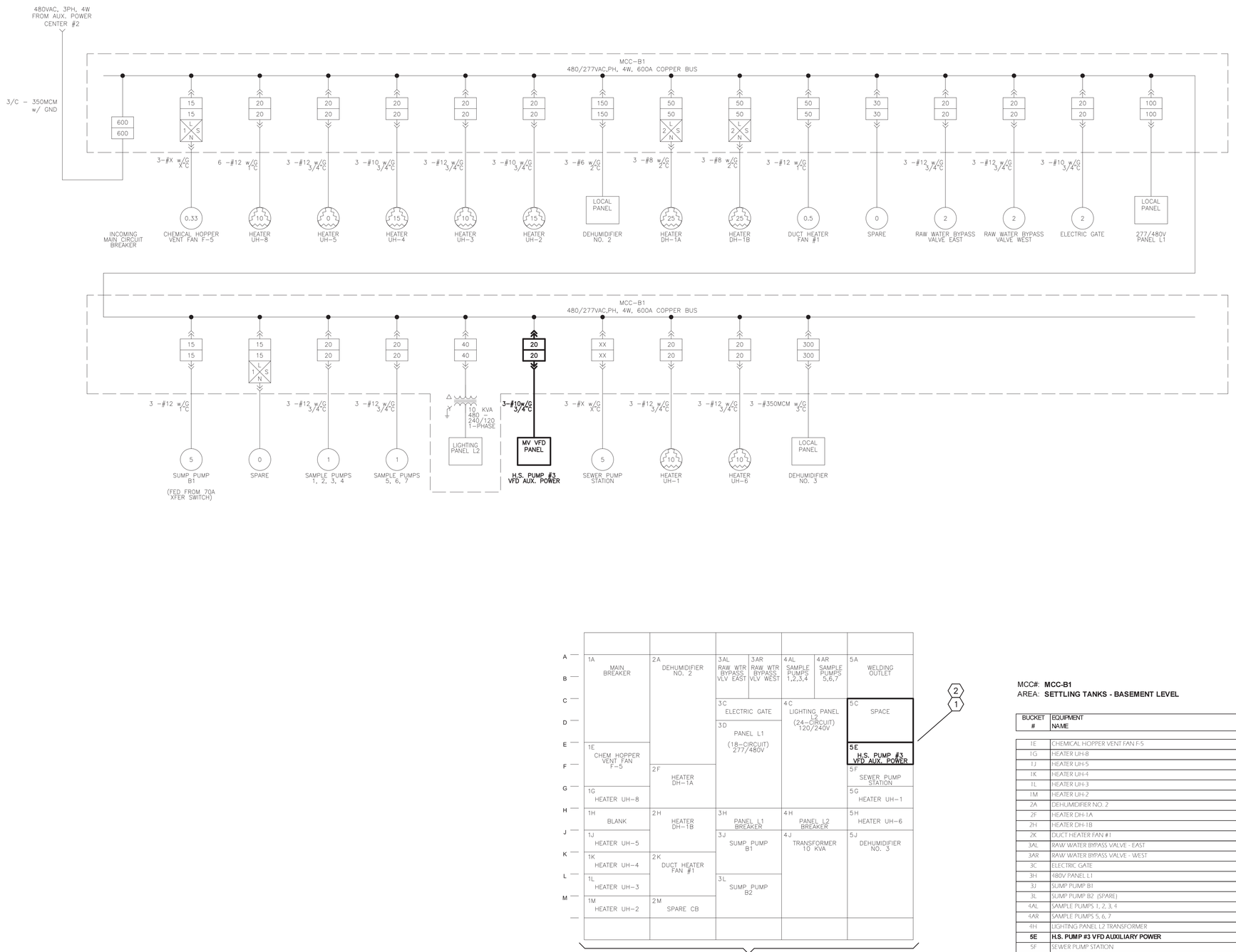
HIGH SERVICE PUMPS NO. 3 & 4 VFD WIRING DIAGRAM

SCALE: AS SHOWN

E–605

SHEET 17 OF 19

User: ###### Spec: AUS-NCSMOD Plot Date: Matt_PC; 10/26/2015; 11:30 ; Layout:E-605
File:D:\ASE\GCWW - CHARLES BOLTON HS PUMPS VFD\DRAWINGS\CADD DRAWINGS\BWTP-E-605.DWG Scale:1:1 SavedDate:6/15/2015 Time:12:33



GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.
2. EXISTING MCC INFO:
   GENERAL ELECTRIC 7700 LINE CONTROL CENTER
   CAT. NO. 0379X0269M01

(X) SHEET KEYNOTES:

1. FURNISH AND INSTALL NEW PANEL DOORS FOR MCC BUCKETS – ONE FOR NEW SPARE BUCKET AND ONE FOR NEW CIRCUIT BREAKER. NEW CIRCUIT BREAKER DOOR SHALL HAVE DOOR–MOUNTED OPERATOR. FURNISH AND INSTALL NEW 20A CIRCUIT BREAKER FOR MCC. EXISTING MCC IS A GENERAL ELECTRIC 7700 LINE CONTROL CENTER.
2. FURNISH AND INSTALL NEW PHENOLIC TAGS FOR EACH BUCKET, TO MATCH EXISTING WHITE LETTERING ON BLACK BACKGROUND.

MCC#: **MCC-B1**
AREA: **SETTLING TANKS - BASEMENT LEVEL**

BUCKET #	EQUIPMENT NAME	HP	KVA	AMPS	VOLTS	STARTER LOCATION	DEVICE TYPE	DEMAND FACTOR	DEMAND KVA
1E	CHEMICAL HOPPER VENT FAN F-5	0.33		1.1	460	MCC	FVNR	0.8	0.2
1G	HEATER UH-8		10	1.1	460	N/A	CB	0.8	8.0
1J	HEATER UH-5		0	0	460	N/A	CB	0.8	0.0
1K	HEATER UH-4		15	18.8	460	N/A	CB	0.8	12.0
1L	HEATER UH-3		10	3.4	460	N/A	CB	0.8	8.0
1M	HEATER UH-2		15		460	N/A	CB	0.8	12.0
2A	DEHUMIDIFIER NO. 2	13.25	90	113.1	460	LOCAL CP	CB	0.8	81.8
2F	HEATER DH-1A		25	1.1	460	MCC	FVNR	0.8	20.0
2H	HEATER DH-1B		25		460	MCC	FVNR	0.8	20.0
2K	DUCT HEATER FAN #1	0.5			460	LOCAL CP	CB	0.8	0.4
3AL	RAW WATER BYPASS VALVE - EAST	2			460	LOCAL CP	CB	0.2	0.4
3AR	RAW WATER BYPASS VALVE - WEST	2		1.1	460	LOCAL CP	CB	0.2	0.4
3C	ELECTRIC GATE	2			460	LOCAL CP	CB	0.2	0.4
3H	480V PANEL L1		10	27	460	N/A	CB	0.5	5.0
3J	SUMP PUMP B1	5			460	LOCAL CP	CB	0.2	0.9
3L	SUMP PUMP B2 (SPARE)	0			460	MCC	FVNR	0	0.0
4AL	SAMPLE PUMPS 1, 2, 3, 4	1			460	LOCAL CP	CB	0.8	0.7
4AR	SAMPLE PUMPS 5, 6, 7	1		27	460	LOCAL CP	CB	0.8	0.7
4H	LIGHTING PANEL L2 TRANSFORMER		10	12.6	460	N/A	CB	0.8	8.0
5E	**H.S. PUMP #3 VFD AUXILIARY POWER**		**10**		**460**	**LOCAL CP**	**CB**	**0.8**	**8.0**
5F	SEWER PUMP STATION	5			460	N/A	CB	0.5	2.3
5G	HEATER UH-1		10		460	N/A	CB	0.8	8.0
5H	HEATER UH-6		10		460	N/A	CB	0.8	8.0
5J	DEHUMIDIFIER NO. 3	14	165		460	LOCAL CP	CB	0.8	142.3

TOTAL CONNECTED KVA	447.4
TOTAL DEMAND KVA	347.5
TOTAL DEMAND AMPS	417.9
MCC MAIN BREAKER AMPS	600

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SEALS

STATE OF OHIO ROBERT JAMES SMITH 72643 REGISTERED PROFESSIONAL ENGINEER

10/26/15

city of CINCINNATI — GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT
H.S. PUMPS 3 & 4
VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA–300–05X0015
FILE NAME: BWTP–E–606
DESIGNED BY: R. SMITH
DRAWN BY: M. MATSON
CHECKED BY: J. STEED

SHEET TITLE

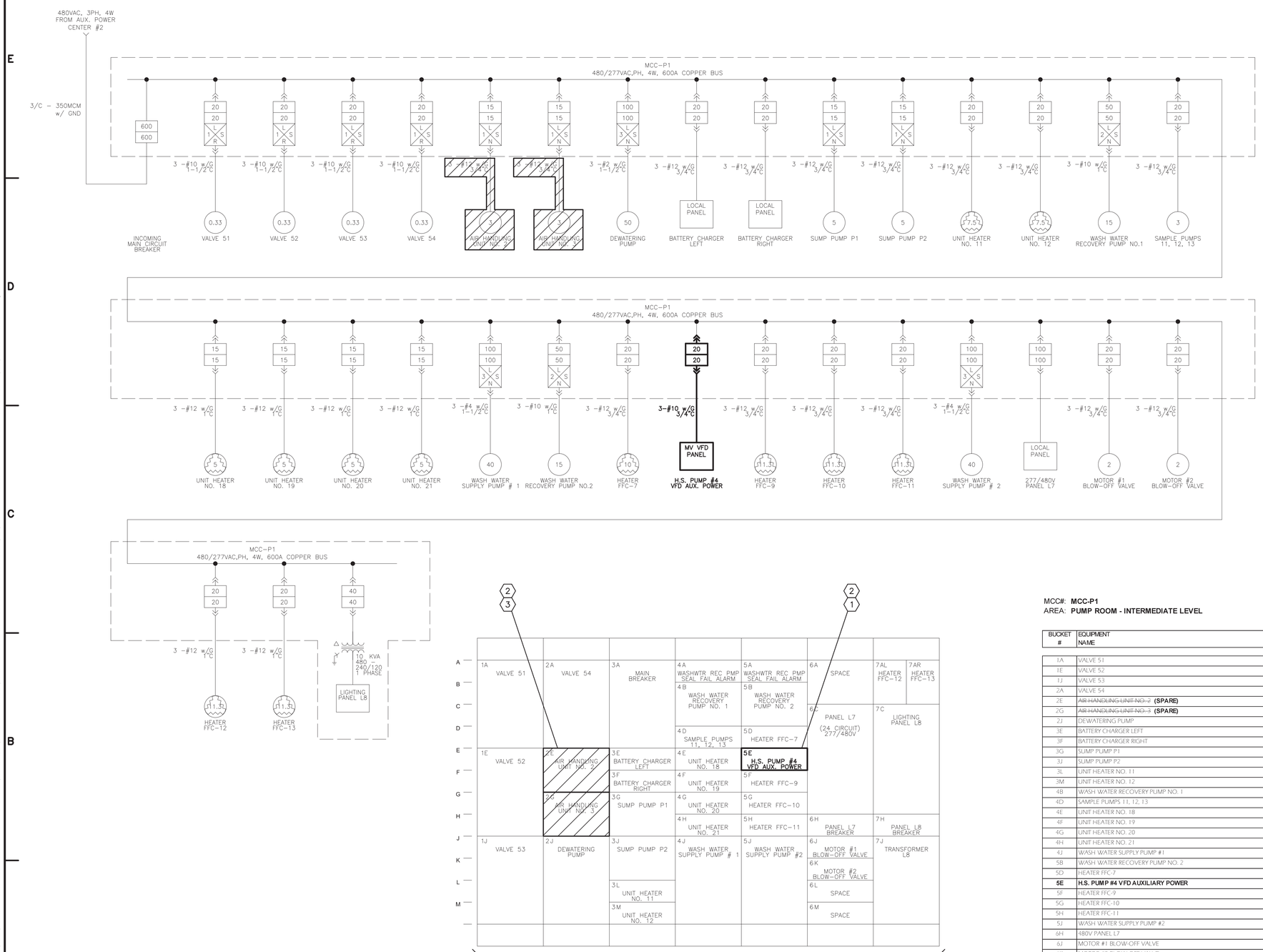
ELECTRICAL

MCC–B1
SINGLE–LINE/LOAD TABLE
MCC ELEVATION

SCALE: AS SHOWN

E–606

SHEET 18 OF 19



GENERAL NOTES:

1. SEE ELECTRICAL LEGEND & ABBREVIATIONS DRAWINGS FOR GENERAL REQUIREMENTS.
2. EXISTING MCC INFO:
   GENERAL ELECTRIC 7700 LINE CONTROL CENTER
   CAT. NO. 379X269M09

(X) SHEET KEYNOTES:

1. FURNISH AND INSTALL NEW PANEL DOOR FOR MCC BUCKET. NEW CIRCUIT BREAKER DOOR SHALL HAVE DOOR-MOUNTED OPERATOR. FURNISH AND INSTALL NEW 20A CIRCUIT BREAKER FOR MCC. EXISTING MCC IS A GENERAL ELECTRIC 7700 LINE CONTROL CENTER.
2. FURNISH AND INSTALL NEW PHENOLIC TAGS FOR EACH BUCKET, TO MATCH EXISTING WHITE LETTERING ON BLACK BACKGROUND.
3. DEMO FEEDERS FROM BREAKER TO AHU UNITS BEING REMOVED. RE-LABEL BUCKETS AS "SPARE".

MCC#: **MCC-P1**
AREA: **PUMP ROOM - INTERMEDIATE LEVEL**

BUCKET #	EQUIPMENT NAME	HP	KVA	AMPS	VOLTS	STARTER LOCATION	DEVICE TYPE	DEMAND FACTOR	DEMAND KVA
1A	VALVE 51	0.33		1	460	MCC	REV	0.2	0.1
1E	VALVE 52	0.33		1	460	MCC	REV	0.2	0.1
1J	VALVE 53	0.33		1	460	MCC	REV	0.2	0.1
2A	VALVE 54	0.33		1	460	MCC	REV	0.2	0.1
2E	~~AIR HANDLING UNIT NO. 2~~ **(SPARE)**	-		-	460	MCC	-	-	-
2G	~~AIR HANDLING UNIT NO. 3~~ **(SPARE)**	-		-	460	MCC	-	-	-
2J	DEWATERING PUMP	50		65	460	MCC	FVNR	0.8	36.8
3E	BATTERY CHARGER LEFT		6.4	8	460	LOCAL CP	CB	0.8	5.1
3F	BATTERY CHARGER RIGHT		6.4	8	460	LOCAL CP	CB	0.8	5.1
3G	SUMP PUMP P1	5		7.6	460	MCC	FVNR	0.2	0.9
3J	SUMP PUMP P2	5		7.6	460	MCC	FVNR	0.2	0.9
3L	UNIT HEATER NO. 11		7.5	9.4	460	N/A	CB	0.8	6.0
3M	UNIT HEATER NO. 12		7.5	9.4	460	N/A	CB	0.8	6.0
4B	WASH WATER RECOVERY PUMP NO. 1	15		21	460	MCC	FVNR	0.8	11.0
4D	SAMPLE PUMPS 11, 12, 13	3			460	LOCAL CP	CB	0.5	1.4
4E	UNIT HEATER NO. 18		5	6.3	460	N/A	CB	0.8	4.0
4F	UNIT HEATER NO. 19		5	6.3	460	N/A	CB	0.8	4.0
4G	UNIT HEATER NO. 20		5	6.3	460	N/A	CB	0.8	4.0
4H	UNIT HEATER NO. 21		5	6.3	460	N/A	CB	0.8	4.0
4J	WASH WATER SUPPLY PUMP #1	40		52	460	MCC	FVNR	0.8	29.4
5B	WASH WATER RECOVERY PUMP NO. 2	15		21	460	MCC	FVNR	0.8	11.0
5D	HEATER FFC-7		11.25	14.1	460	N/A	CB	0.8	9.0
5E	**H.S. PUMP #4 VFD AUXILIARY POWER**		**10**	**12.6**	**460**	**LOCAL CP**	**CB**	**0.8**	**8.0**
5F	HEATER FFC-9		11.25	14.1	460	N/A	CB	0.8	9.0
5G	HEATER FFC-10		11.25	14.1	460	N/A	CB	0.8	9.0
5H	HEATER FFC-11		11.25	14.1	460	N/A	CB	0.8	9.0
5J	WASH WATER SUPPLY PUMP #2	40		52	460	MCC	FVNR	0.8	29.4
6H	480V PANEL L7		10		460	N/A	CB	0.8	8.0
6J	MOTOR #1 BLOW-OFF VALVE	2			460	LOCAL CP	CB	0.2	0.4
6K	MOTOR #2 BLOW-OFF VALVE	2			460	LOCAL CP	CB	0.2	0.4
7AL	HEATER FFC-12		11.25	14.1	460	N/A	CB	0.8	9.0
7AR	HEATER FFC-13		11.25	14.1	460	N/A	CB	0.8	9.0
7H	LIGHTING PANEL L8 TRANSFORMER		10	12.6	460	N/A	CB	0.8	8.0

TOTAL CONNECTED KVA	309.5
TOTAL DEMAND KVA	238.2
TOTAL DEMAND AMPS	286.5
MCC MAIN BREAKER AMPS	600

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city of CINCINNATI
GREATER CINCINNATI WATER WORKS

GCWW BOLTON WATER TREATMENT PLANT H.S. PUMPS 3 & 4 VFD/MOTOR IMPLEMENTATION

NO.	DATE	ISSUED FOR	BY

DATE: OCTOBER 2015
PROJECT NO.: MA-300-05X0015
FILE NAME: BWTP-E-607
DESIGNED BY: R. SMITH
DRAWN BY: M. MATSON
CHECKED BY: J. STEED

SHEET TITLE

ELECTRICAL

MCC-P1 SINGLE-LINE/LOAD TABLE MCC ELEVATION

SCALE: AS SHOWN

E-607

SHEET 19 OF 19